-FINAL-

PHASE 3 FIELD SAMPLING SUMMARY REPORT IN SUPPORT OF RISK ASSESSMENT AT THE OGDEN RAILYARD SITE OGDEN, UTAH

October 2002

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS

AOI	Area of Interest
CLP	Contract Laboratory Program
COC	Chemical of Concern
COPC	Chemical of Potential Concern
CRQL	Method-Required Quantitation Limit
DFTPP	Decafluorotriphenylphosphine
DNAPL	Dense Non-Aqueous Phase Liquid
DQO	Data Quality Objective
dw	Dry weight
ECD	Electron Capture Detector
EPT	Ephemeroptera Plecoptera Trichoptera
ERT	Emergency Response Team
FCV	Final Chronic Value
FSP	Field Sampling Plan
GC	Gas Chromatograph
GPC	Gel Permeation Chromatography
GPS	Global Positioning System
HASP	Health and Safety Plan
IQS	Internal Quantitation Standard
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
MDL	Method Detection Limit
MRI	Midwest Research Institute
MRQL	Method Required Quantitation Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MS	Mass Spectrometer
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PARCC	Precision, Accuracy, Representativeness, Completeness and Comparability
PCB	Polychlorinated Biphenyl
PE	Performance Evaluation
PEM	Performance Evaluation Mixtures
PFK	Perfluorokerosene
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance and Quality Control
QAPP	Quality Assurance Project Plan
RBC	Risk Based Concentrations
RI	Remedial Investigation
RPD	Relative Percent Difference
RRFs	Relative Response Factors
RRTs	Relative Retention Times
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SOP	Standard Operating Procedure
SIM	Selective Ion Monitoring

TEC	Threshold Effect Concentration
TIC	Tentatively Identified Compounds
TOC	Total Organic Carbon
UPRR	Union Pacific Railroad
US	United States
EPA	Environmental Protection Agency
UTM	Universal Transverse Mercator
VTSR	Verified Time Sample Receipt
ww	Wet weight
%Ds	Percent Differenes
%RSDs	Percent Relative Standard Deviations

1.0 INTRODUCTION

1.1 Purpose

This document reports the results of the Phase 3 Field Investigation completed for the Union Pacific Railroad (UPRR) Ogden Railyard Site in support of human and ecological risk assessment. The scope of the investigation was specified by a sampling and analysis plan (SAP) completed in June of 2001 by the U.S. Environmental Protection Agency (USEPA) Region 8 (USEPA, 2001a).

1.2 Scope

The Ogden Railyard is located in Weber County, Utah, on the western edge of the city of Ogden (Figure 1-1). The Railyard is oriented in a north-south direction, covering a linear distance of about 3.4 miles. The site is currently owned and operated by the UPRR.

The UPRR entered into a voluntary agreement with the USEPA to investigate and address environmental contamination associated with the Railyard. A Phase I Remedial Investigation (RI) of the nature and extent of contamination at the site was performed (Safety-Kleen, 1999). The Phase I investigation identified 31 Areas of Interest (AOIs) located on UPRR property, and revealed the presence of a number of chemical classes in soil, sediment, groundwater and surface water, including:

- Diesel fuel, grease, oils, and associated petroleum hydrocarbons
- Chlorinated solvents and associated degradation products
- Metals
- Pesticides
- Polycyclic aromatic hydrocarbons (PAHs)

The USEPA reviewed the adequacy of the Phase I data to support reliable human health and ecological risk evaluations, and identified additional sampling and analysis of environmental media that was needed to support the human and ecological risk assessments at site-related locations. In December 1999, the EPA developed a SAP to collect the additional data (USEPA, 1999). A field sampling plan was issued in early 2000 (USEPA, 2000) with the field work completed in May and July of 2000. This additional sampling is referred to as Phase 2. The results of the Phase 2 Investigation were summarized in a reported issued by EPA in 2001 (USEPA, 2001b) and the Forrester Group in 2001 (Forrester Group, 2001a,b).

During the Phase 2 investigations, two important new concerns associated with the site were identified:

- A large plume of dense non-aqueous phase liquid (DNAPL) was located below the ground surface (Forrester Group, 2001b). This DNAPL zone is suspected to originate at the location of a former Pintsch gas process plant that produced gas from petroleum products (manufactured gas). The former Pintsch Gas facility was located northeast of the current waste water treatment facility (AOI-34) at the northern end of the railyard. The DNAPL zone extends towards the north, under 21st Street, coming into direct contact with the east end of the 21st Street Pond and extending under the Ogden River. A map showing the DNAPL zone location is provided in Figure 1-2.

- Polychlorinated biphenyls (PCBs) were detected in tissues of fish collected from the 21st Street Pond as well as in sediments collected from the 21st Street Pond and the Ogden River (USEPA, 2001a).

These two new concerns at the site generated the need to collect additional samples specifically designed to characterize the potential risk to human health and the environment from the DNAPL zone and the PCBs. The USEPA developed a SAP in July 2001 (USEPA, 2001a) to guide the collection of samples for the purposes of risk assessment. This additional sampling event, conducted in July and August of 2001, is referred to as Phase 3. The results from this sampling effort are reported in this document.

1.3 Organization

In addition to this introductory section, this report is organized into the following sections:

Section 2. Section 2 provides a summary of the field sampling methods used during investigations completed in July and August of 2001. This section includes the sampling locations, DNAPL study design, PCB study design, analytical methods, sampling methods and sampling documentation, handling and custody.

Section 3. Section 3 provides the results of the quality control portion of the investigation. This includes field blank samples, field split samples and performance evaluation samples.

Section 4. Section 4 provides an assessment of the data usability. This includes data verification and data validation. Data verification evaluates the sampling methods, sample documentation, sample custody, handling and shipment and laboratory analyses. Data validation examines the precision, accuracy, representativeness, comparability and completeness of the data as well as the validation of the analytical data.

Section 5. Section 5 describes the results of the sediment sampling. The sediment sampling includes, sediment collection, sediment chemical analyses (semivolatiles, polycyclic aromatic hydrocarbons (PAHs), pesticides and PCB Aroclors, PCB congeners and total organic carbon (TOC)) as well as sediment toxicity testing.

Section 6. Section 6 describes the results of the measurement of groundwater flux.

Section 7. Section 7 describes the results of sediment porewater sampling and analyses. This includes analytical results for both semivolatiles as well as PAHs by selective ion monitoring (SIM).

Section 8. Section 8 provides the results of soil sampling. This includes soil sampling methods as well as the analyses of pesticide and PCB Aroclors.

Section 9. Section 9 provides the results of benthic macroinvertebrate and drift sampling. This includes the chemical analyses of tissues for PAHs and PCB congeners as will as community or taxonomic identification.

Section 10. Section 10 provides the results of fish sampling. This includes fish collection and analyses of tissues for PAHs and PCB congeners.

Section 11. Section 11 provides references for the report.

2.0 FIELD SAMPLING METHODS

The USEPA has developed a seven-step Data Quality Objectives (DQO) procedure that is designed to ensure that sampling and analysis plans are carefully thought out and that the results of a sampling effort will be adequate to meet the basic objectives of the program. This seven-step procedure was applied in the Phase 3 SAP to each of two main parts of the sampling program. The two main parts were focused on the DNAPL zone and PCB contamination respectively:

DNAPL Investigation. Part 1 of the Phase 3 SAP was designed to investigate the extent to which the DNAPL is impacting the aquatic environment of the Ogden River, with special reference to the reach where the Ogden River flows above the DNAPL zone. In addition, the investigation was designed to investigate more thoroughly the potential impacts of the DNAPL on the 21st Street Pond. Impacts are readily apparent at the east end of the pond where the DNAPL actually intersects the pond, but potential impacts in other parts of the pond are not well characterized. These goals were achieved by collection and analysis of samples of environmental and biological media (sediment, pore water, benthic invertebrate tissue and fish tissue) at locations in the 21st Street Pond and the Ogden River where the DNAPL has the potential to be causing effects.

PCB Investigation. Part 2 of the Phase 3 SAP was designed to provide information that may help identify the source of PCB contamination in the Ogden River and the 21st Street Pond, to more completely characterize the nature and extent of the contamination, and to collect data sufficient to support reliable risk evaluation for human and ecological receptors exposed to the PCBs. This was accomplished by collection and analysis of samples of abiotic environmental media (soil, sediment) as well as biotic samples (benthic organisms, fish) from locations potentially impacted by PCBs.

2.1 Sampling Locations

Figure 2-1 provides a schematic drawing of the 14 reaches targeted for sampling in the Phase 3 SAP. To the maximum extent possible, sampling locations for environmental and biological media were collocated to decrease costs and increase interpretive powers. The locations were situated in areas exhibiting similar habitat characteristics including substrate composition, riparian vegetation, topographic relief, channel morphology, flow velocity, watershed features, and land use.

Because each reach could be up to several miles in length, the reach was designated into several sub-locations (ie: Ogden River, Reach 1 - 1A, 1B, 1C). In general, for rivers and channels, sub-locations were assigned as upstream (A), midstream (B) and downstream (C). For the 21st Street Pond and Buena Ventura Park Pond, individual sampling locations are assigned as unique sub-locations (Buena Ventura Park Pond, Reach 8 - 8A, 8B). Table 2-1 lists the reaches, sub-locations, station IDs, location descriptions, and UTM coordinates that were sampled during the Phase 3 sampling effort conducted in July and August 2001. Figure 2-2 is a map showing all sampling stations within each reach. Photographs of sampling locations are provided as Figure 2-3.

2.2 DNAPL Study

The DNAPL investigation was designed to collect samples of sediment and pore water from locations judged to be the most likely areas of DNAPL impact (gaining reaches), and to compare these results to samples from locations judged to not be of concern from the DNAPL. The DNAPL investigation was staged as tiers with the implementation of later tiers being dependant on the first tier. The first tier in the

investigation was to measure the direction of water flow (gaining or losing) to identify if the river was gaining or losing to groundwater. If reaches were identified as gaining then measures of benthic invertebrate community health and in situ toxicity would be collected as the second tier. Table 2-2 provides a list of the areas targeted for sampling in the Phase 3 SAP along with the target number and types of samples from each area.

These sampling locations included reaches of the Ogden River upstream, directly above, and downstream of the location of the DNAPL zone beneath the river. The upstream location served as a reference for the two downstream reaches. Sampling was also planned for the east and west sides of the 21st Street Pond with samples collected from the Buena Ventura Park Pond serving as a reference area. The numbers and types of samples identified in the Phase 3 SAP were subject to adjustment in the field as a function of actual field conditions.

2.3 PCB Study

The PCB Investigation detailed in the Phase 3 SAP was designed to fulfill two main objectives: 1) provide additional information on the spatial pattern of PCB contamination in order to identify potential sources, and 2) collect data on PCB levels in site media that are adequate to support human and ecological risk assessment calculations.

Information on the spatial pattern of PCB contamination was collected using measurements of PCB concentrations in sediments of the Ogden and Weber Rivers and the 21st Street Pond. In addition, measurement of PCB concentrations in benthic invertebrates and fish tissue were also targeted. The data identified in the Phase 3 SAP as needed for human and ecological risk assessment also included the sediment, benthic invertebrate and fish tissue data. Benthic invertebrates were collected for tissue analyses at locations collocated with sediment samples. Fish samples were also collected from the same general locations as sediment and benthic invertebrates.

Table 2-3 lists the areas targeted for sampling in the Phase 3 SAP along with the target number and types of samples from each area. These numbers identified in the Phase 3 SAP were subject to adjustment in the field as a function of actual field conditions. The identified sampling locations included reaches of the Ogden and the Weber Rivers that are upstream, between, or downstream of potential source areas.

The Phase 3 SAP also called for the collection of soils for analyses of PCBs from several potential source areas, including the Pioneer Electric Power Plant, any identified and exposed landfill areas, and possibly some abandoned meanders of the Ogden River. Sampling of sediments was also targeted to occur within storm sewer outfalls that were considered plausible conduits of PCBs to either the Ogden or the Weber Rivers.

2.4 Analytical Methods

Samples collected during this study were analyzed for semivolatile organic compounds, PAHs, PCB Aroclors and PCB congeners. Because both PAHs and PCBs are mixtures of different chemicals, special concerns and needs arose in the analysis of both classes. The following subsections describe the analytical approach used for each type of analyte in each type of environmental medium.

2.4.1 PAH Analysis

PAHs are a class of compounds characterized by two or more fused aromatic rings. Of the many different PAHs which exist, 16 are typically identified and quantified as individual chemicals. Table 2-4 lists these 16 PAHs along with the target analytical detection limits identified in the Phase 3 SAP as needed for human health and ecological risk assessment.

Several different methods were identified as available for the analysis of PAHs which differed in their ability to reliably detect, identify and quantify individual PAHs, and in their cost. For the purposes of the Phase 3 Investigation, all sediment and water samples were targeted for analysis using Contract Laboratory Program (CLP) Method OLM04.2 for semivolatiles. The Contract-Required Quantitation Limit (CRQL) for PAHs by this method are listed below:

Medium	CRQL
Soil/Sediment	0.33 mg/kg
Water	10 ug/L

The CRQL for soil and sediment samples was identified as adequate for human health risk evaluation, but was not adequate for evaluation of ecological risks. Likewise, the CRQL for water was also identified as not adequate for evaluation of ecological risk for some chemicals in water. Therefore, analysis of all sediment and water samples were targeted for Selective Ion Monitoring (SIM) in an effort to improve analytical quantitation limits (by up to a factor of about 10-fold). This method was not applicable to biotic samples (benthic or fish tissue) so these samples were analyzed using EPA Method 8270.

Tables 2-5 and 2-6 summarize the detection limits achieved for both the analysis of semivolatiles using the CLP method and for PAHs using the SIM method. The detection limits for most samples fell within those expected for each of the respective methods and the data were judged to be suitable for risk assessment. The semivolatile analysis yielded one sediment sample with detection limits of 14 to 34 mg/kg. This sample was qualified as rejected and will not be used for risk assessment.

2.4.2 PCB Analysis

As with PAHs, PCBs are a mixture of individual congeners (a total of 209 congeners are possible). Traditionally, PCBs have been quantified by estimating the amount of a commercial Aroclor mixture that would yield peak heights of selected congeners equivalent to those observed in the field sample. More recently, methods have been developed that reliably identify and quantify the amount of some or all of the individual PCB congeners in a mixture. The latter approach (congener-specific analysis) is technically superior to the first approach (estimation of the Aroclor equivalent concentration), since the toxicity of the PCBs depends on which specific congeners are present, and because the relative amounts of different congeners will change over time as a function of fate and transport processes in the environment. However, congener-specific analysis is also substantially more costly than Aroclor-equivalent analysis.

Table 2-7 lists the target analytical detection limits that are needed for human health and ecological risk assessment at this site, both for the Aroclor-equivalent approach and the congener-specific approach. As seen, the congener analysis was limited to the 12 congeners that are typically most toxic to human and ecological receptors.

For the purposes of this project, screening-level analysis of all sediment and soil samples for Aroclor-equivalent concentrations was performed by CLP Method OLM04.2 for pesticides and Aroclors. The CRQL for most Aroclors by this method is 33 ug/kg. Detection limits for Aroclors ranged from 33 to 220 ug/kg for all soil and sediment samples.

However, this CLP method is not applicable to biological tissue samples (benthic invertebrates and fish tissue), so a subset of the biotic samples were analyzed using the congener-specific approach specified in EPA Method 1668. Detection limits for most congeners with this method are in the low ppt range (e.g., 0.001 ug/kg dw). These detection limits were judged as adequate for both human and ecological risk assessment.

Table 2-8 summarizes the detection limits achieved for the analyses of PCB congeners. These detection limits fell within those expected for each of the methods and the data was judged to be suitable for risk assessment.

2.5 Sampling Methods

Samples were collected during this program according to the Standard Operating Procedures (SOPs) established in the Phase 3 SAP. The SOPs were included in Appendix A of the Phase 3 SAP and are summarized below:

Standard Operating Procedures (SOPs)		
Category	**Type**	**SOP Number**
Sample Collection	Pore Water	SRC-OGDEN-01
	Sediment	SRC-OGDEN-04
	Soil	SRC-OGDEN-02
	Benthic organisms	SRC-OGDEN-09
	Fish	SRC-OGDEN-03
Sediment Toxicity	Sediment	EPA Test Method 100.1 (USEPA, 1994; ASTM, 1997)
Groundwater Flux	Water Flux	SRC-OGDEN-06
General Procedures	Sample Documentation	SRC-OGDEN-07
	Sample Handing and Shipping	SRC-OGDEN-08
	Chain of Custody	SRC-OGDEN-10
	GPS Calibration and Use	SRC-OGDEN-11

Every reasonable effort was made to adhere strictly to the specified SOPs for sample collection. Where deviation from an SOP was unavoidable, the deviation was documented in the field log book (Appendix A) and its potential impact on the outcome of the data collection effort was also recorded. The general procedures for sample collection are discussed in each of the following sections according to environmental media type.

2.6 Sample Documentation, Handling and Custody

2.6.1 Sample Documentation

The collection of samples was documented according to SOP #SRC-OGDEN-07 and -11 for sample documentation and GPS calibration and use. For each sample collected, the following information was recorded in the field log book:

- Names of team members
- Date and time of sample collection
- Location (UTM coordinates) of sample collection site
- Number and type of samples collected
- Any special circumstances that influenced sample collection
- Sample type
- Sample identification

Each sample was labeled with a unique random number, derived from a sheet of pre-printed numbers. For the purposes of the Phase 3 sampling, all sample identification numbers began with the prefix "3-OG" to designate the Phase 3 Ogden sampling. A matching pre-printed label derived from the same sheet was appended to the field log book entry for that sample to ensure that the sample and the information related to that sample are correctly matched. A copy of the field log book is provided as Appendix A.

2.6.2 Sample Custody, Handling and Shipping

Sample custody, handling and shipping was completed according to SOP #SRC-OGDEN-10 and -08 for chain of custody procedures, and sample shipping and handling. A chain of custody form accompanied every shipment of samples to each analytical laboratory. The purpose of the chain of custody form was to establish the documentation necessary to trace possession from the time of collection to final disposal, and to identify the type of analysis requested. All corrections to the chain of custody record were initialed and dated by the person making the corrections. The originals accompanied the samples to the laboratory, and copies documenting each custody change were recorded and kept on file. The chain of custody forms described:

- Number of containers
- Sample preservative
- Date and time of sample shipments
- Analysis requested

All required paper work, including sample container labels, chain of custody forms, custody seals and shipping forms were fully completed in ink (or printed from a computer) prior to shipping of the samples to the laboratory. Shipping from the field to each analytical laboratory was by priority overnight (next morning) delivery.

Upon receipt, the samples were given to the laboratory sample custodian. The coolers were opened and the contents inspected. Chain of custody forms were reviewed for completeness, and samples were logged and assigned a unique laboratory sample number. Any discrepancies or abnormalities in samples were noted and rectified, if possible.

Chain of custody was maintained until final disposition of the samples by the laboratory and acceptance of analytical results by the USEPA. One copy of the chain of custody was kept in file by field personnel. Copies of all chain of custody forms are provided as Appendix B.

3.0 QUALITY CONTROL

Quality Control (QC) is a component of the Quality Assurance Plan, and consists of the collection of data that allow a quantitative evaluation of the accuracy and precision of the field data collected during the project. The QC program included both laboratory-based and field-based QC samples (see Table 3-1).

Laboratory-Based QC Samples. Each analytical method used specifies a set of quality control samples which must be prepared and analyzed by the laboratory to establish that the method is operating within specified requirements. These laboratory-based QC samples are evaluated as part of the data validation process (Section 4.0) to ensure that all analytical data were collected in accordance with the specified procedures.

Field-Based QC Samples. Field-based QC samples are prepared in the field and submitted to the laboratory in a blind fashion. That is, the laboratory is not aware the sample is a QC sample, and should treat the sample in the same way as a field sample. There were three types of field-based QC samples used during the Phase 3 sampling including: field blank, field split and performance evaluation samples.

3.1 Field Blank Samples

Field blank samples were collected from equipment used to collect samples after decontamination procedures were completed. These samples were not expected to contain any contaminant. If contamination were found in these samples, the contamination would reflect either poor decontamination procedures or materials introduced to samples from the sampling equipment. Field blanks are normally collected for water samples, but not for soil, sediment or biotic samples.

For the purposes of this project, the Phase 3 SAP identified the collection of field blanks for pore water samples at a minimum rate of 5%. Table 3-2 summarizes the field blank samples collected and the analytes detected in each sample. As seen, acetophenone (2J ug/L), naphthalene (0.2J ug/L), and bis(2-ethylhexyl)phthalate (1J ug/L and 69 ug/L) were the only chemicals ever detected in the field blanks.

3.2 Field Split Samples

Field split samples were prepared by dividing a field sample into two parts and analyzing each independently. The results of field split sample analysis help evaluate analytical precision as well as possible heterogeneity in samples. Field splits were submitted for sediment, pore water, benthic macroinvertebrate tissue and fish tissue at a rate of approximately 5% for each medium (sample mass permitting). The minimum number of field splits was two per medium. A summary of all field split samples is provided in Table 3-3. Analytical results are provided in Appendix C.

3.3 Performance Evaluation Samples

Performance Evaluation (PE) samples are samples of a matrix that contain a known and certified level of a contaminant. The results of PE sample analysis helps to evaluate analytical accuracy. PE samples were available commercially for PAHs, PCB Aroclors, PCB congeners and TOC in soil. PE samples were added in random order to the field samples for sediment and soil at a rate of approximately 5% for each analysis type. The minimum number of PE samples was 1 to 2 per analysis type. Table 3-4 summarizes the PE samples analyzed for the Phase 3 sampling.

4.0 DATA USABILITY

Data usability is evaluated by two processes including data verification and data validation. Data verification is a consistent and systematic process that determines whether the data have been collected in accordance to the specifications as listed in the approved Quality Assurance Project Plan (QAPP). This process is independent of data validation, and is conducted at various levels both internal and external to the data generator (laboratory).

Data validation is an evaluation of the technical usability of the verified data with respect to planned objectives. Data validation is performed external to the data generator (laboratory) by applying a defined set of performance criteria to the body of data in the evaluation process. This may include checks of some or all of the calculations in the data set, and reconstruction of some or all final reported data from initial laboratory data (e.g., chromatograms, instrument printouts). It is in the data validation process that data qualifiers for each verified datum are evaluated and assigned. It extends beyond the analytical method or contractual compliance to protocols to address the overall technical usability of the generated data.

4.1 Data Verification

Data verification included a review of the findings of all QA assessment activities including assessments of field collection procedures, sample labeling methods, chain of custody procedures, and all assessments of analytical data collection, recording and reporting. If any deviations are identified, the potential impact of those deviations on the reliability of the data are assessed.

4.1.1 Sampling Methods

There were no deviations from the identified sampling methods. An attempt was made to collect sediment samples using a coring device as this was the preferred method as described in the SOP. The bottom substrate present, however, prevented sediment collection in this manner. Most sediments were collected using a tulip bulb planter and a few with a stainless steel scoop. Some fraction of the sediment sample may have been lost to the water column by using these devices. This change does not alter the quality of the data collected.

4.1.2 Sample Documentation

There were no deviations from the identified methods for sample documentation.

4.1.3 Sample Custody, Handling and Shipping

Some samples were broken in shipment to both the CLP laboratory and Midwest Research Institute (MRI) during the first sampling shipment in July. Table 4-1 lists the samples that were broken in shipment and how they were replaced.

4.1.4 Laboratory Analyses

Table 4-2 presents the pore water samples collected in July 2001 that were sent to the CLP laboratory for analysis of PAHs by the SIM method. The laboratory completed the initial processing of these samples in error and the SIM analyses could not be completed. These samples were shipped to the laboratory in two separate 1 liter bottles (with 2 separate field identifications). The laboratory analyzed each bottle as a

separate sample for semivolatiles but did not split the samples prior to processing to allow for the SIM analyses.

Table 4-3 summarizes the pore water samples recollected during the August 2001 sampling event and resubmitted to the laboratory for analysis of PAHs by the SIM method. As a consequence of this, it was also necessary to reanalyze each sample for semivolatiles as well. For this shipment of porewater samples, to avoid confusion, each of the 2 separate 1 liter bottles for one sampling location were labeled with the same field sample identification number.

4.2 Data Validation

The data validation process consisted of evaluation of individual samples collected and analyzed to determine if results are within acceptable limits. These quantitative or qualitative limits of acceptability are defined for Precision, Accuracy, Representativeness, Comparability, and Completeness (PARCC), as discussed in the following subsections.

4.2.1 Precision

Precision is defined as the agreement between a set of replicate measurements without assumption or knowledge of the true value. Data on precision are obtained by analyzing split or replicate samples. Agreement is expressed as either the relative percent difference (RPD) for split measurements, or the range and standard deviation for larger numbers of replicates. The field split samples collected during the Phase 3 sampling event are summarized in Section 3.2. The following sections examine, separately, the split samples for the CLP data (semivolatiles and PCB Aroclors), the PAH and PCB congener data from MRI laboratories the TOC analyses from Severn Trent laboratory.

4.2.1.1 CLP Data for Semivolatiles and PCB Aroclors

Table 4-4 provides the results of the analysis of the field split samples (field sample and split) completed by the CLP laboratory for semivolatiles in pore water, sediment and soil samples and PCB Aroclors in sediment and soil samples. In comparing the field samples versus the split samples there are 725 analyte pairs of data. Of these data pairs, 82.3% are non-detects, 12.7% are cases where the analyte was detected in both the field sample and split sample and 5.0% were cases where the analyte was detected in either the field sample or split but not the other sample.

Figure 4-1 plots the result of the field sample versus split for each analyte pair in which both results were detected. Included in this figure is a line of identity (if both the field sample and the split sample had equal concentrations for every analyte, in every sample, all points would fall on this line). The results indicate a general agreement between field and split samples.

4.2.1.2 PCB Congener and PAH Data by MRI

Table 4-5 provides the results of the analysis of the field split samples (sample and split) completed by the MRI for the PAHs in tissue and PCB congeners in sediment and tissue. In comparing the field samples versus the split samples, there are 60 analyte pairs of data. Of these data pairs, 43.3% are non-detects (analyte not detected in either sample), 55.0% are cases where the analyte was detected in both the field sample and split sample and 1.7% were cases where the analyte was detected in either the field sample or split but not the other sample.

Figure 4-2 plots the result of the field sample versus split for each pair in which both results were detected. Included in this figure is a line of identity (if both the field sample and the split sample had equal concentrations for every analyte, in every sample, all points would fall on this line). The results indicate a general agreement between field and split samples.

4.2.1.3 TOC Data

Table 4-6 provides the results of the analyses of the field split samples (sample and split completed by Severn Trent laboratory for the analyses of TOC in sediment. In comparing the field samples versus the split samples there are 4 pairs of data. Of these data pairs, 100% are cases where the analyte was detected in both the field sample and split sample. Comparison of these results indicate a general agreement between field and split samples.

4.2.2 Accuracy

Accuracy is a measure of the closeness of a sample analysis result to the "true" value. The accuracy of an analytical method is generally assessed by inserting a series of blind "performance evaluation" (PE) samples into the laboratory sample stream, where the "true" concentration of analyte in each PE sample is known. PE samples are available for sediments and soil samples for PCB Aroclors, PCB congeners and PAHs.

4.2.2.1 PAHs by CLP

The results of the analysis of the PAH PE samples are summarized in Table 4-7. All analyses were within the acceptability limits with the exception of benzo(g,h,i)perylene in two samples that were measured at concentrations slightly lower than the acceptability limits.

4.2.2.2 PCB Aroclors by CLP

The results of the analysis of the PCB Aroclor PE samples are summarized Table 4-8. All analyses were within the acceptability limits.

4.2.2.3 PCB and Dioxin/Furan Congeners by MRI

The results of the analysis of the PCB and dioxin/furan congener PE samples are summarized in Table 4-9. These PE samples have verified concentrations but have not been used long enough to establish acceptability limits. The analysis of the PE samples by MRI based on examination of the measured results compared to the nominal values were judged to be acceptable and the overall analyses suitable for risk assessment.

4.2.2.4 Total Organic Carbon by Severn Trent

One TOC PE sample was submitted with the soil and sediment samples sent to Severn Trent laboratory. The performance standard nominal value was 12,400 mg/kg, with acceptability limits of 8,000 to 16,700 mg/kg. The measured TOC concentration (14,900 mg/kg) in the PE sample was within acceptability limits.

4.2.3 Representativeness

Representativeness is the degree to which data accurately and precisely represent characteristics of a population, parameter variations at a sampling point, or an environmental condition. In the Phase 3 SAP, representativeness was ensured by the selection of sampling locations in accordance with the sampling design requirements.

4.2.4 Comparability

Data are comparable if collection techniques, measurement procedures, methods, and reporting units are equivalent for the samples within a sample set. These criteria allow comparison of data from different sources. Comparable data will be obtained by specifying standard units for physical measurements and standard procedures for sample collection, processing, and analysis. These requirements are specified in the Phase 3 SAP including the sample collection procedures specified as SOPs and the analytical measurements and reporting units.

4.2.5 Completeness

Data are considered complete when a prescribed percentage of the total intended measurements and samples are obtained. Analytical completeness is defined as the percentage of valid analytical results requested. For this sampling program, a minimum of 90% percent of the planned collection of individual samples for quantification must be obtained to achieve a satisfactory level of data completeness. The following table summarizes the planned number of samples and analyses specified in the Phase 3 SAP and identifies those collected during the July and August 2001 sampling events. This table does not include the samples that were identified as contingent on field conditions and the outcome of other measurements (ie: the inclusion of in-situ toxicity testing and benthic invertebrate community analyses in the Ogden River). The results of the groundwater flux measurements (described in Section 6.0) indicated that the Ogden River was losing to groundwater within the reach intersecting the DNAPL zone, therefore, in-situ toxicity testing and sampling of the benthic invertebrate community was not completed.

A summary table of all the samples collected during the Phase 3 investigation was presented in Table 3-1. The sampling program was considered completed as 90% (153 collected/170 planned in Round 1) of the planned collection of individual samples were obtained. The Phase 3 SAP identified collection of six soil samples from the Pioneer Power Plant property. However, during field sampling appropriate areas for soil sampling on the property were not collected as the area consisted of landscaped areas with grass. One extra sample for analysis of PCBs was collected from the Ogden River within Reach 3 (location 3B near a seepage area behind the 21st Street Pond). In addition, one extra split sample for PCB Aroclors was also collected. This reduced the number of PCB Aroclor samples from the 55 samples planned in the SAP to 50 during the field investigation.

Based on the results of the groundwater flux measurements, only 8 pore water field samples were collected from either the 21st Street Pond or the Ogden River. The number of water samples for the analysis of semivolatiles by CLP and PAHs by the SIM method was reduced from 19 as planned in the SAP to 11 during the field investigation.

The total number of fish tissue samples identified for analyses in the Phase 3 SAP included analysis of PCB congeners in three different fish game species from the Ogden River Reach 3. As only brown trout were captured during field sampling, fewer samples of fish tissue were analyzed in Round 1 than planned.

4.2.6 Validation of Analytical Data

Validation of the analytical data was completed by a subcontractor using the USEPA CLP Functional Guidelines for organics analysis (USEPA, 1999) and Test Methods for Evaluating Solid Wastes (USEPA, 1992). Full validation was performed on 10% of the analytical samples and a cursory validation was performed on the remaining samples. The full validation entailed a review of the raw data for completeness and transcription accuracy onto the summary forms. Approximately 10 to 20% of the results reported in each of the full validated samples, calibrations, and laboratory QC analyses were recalculated and verified. If problems were identified during the recalculation of results, a more thorough calculation check was performed. The cursory validation entailed reviewing most of the same parameters as a full validation, but raw data were not used - only summary forms. Therefore, if summary forms were not provided for a specific compliance requirement (i.e., spike recoveries), that information was not evaluated. No calculations were verified for cursory validation. The validation of the analytical data is summarized in Data Validation Reports for each sample delivery group (SDG) examined. These reports are included as Appendix D. Table 4-10 lists the samples for which a full validation was completed.

The validation of the analytical data included a review of the following:

- Holding Times and Preservation
- Instrument Tuning
- Calibrations
- Blanks
- Surrogate Recoveries
- Internal Standard Criteria
- Matrix Spike/Matrix Spike Duplicates
- Blank Spikes (Laboratory Control Samples)
- Target Compound Identification (full validation only)
- Compound Quantitation and Reporting Limits (full validation only)
- Tentatively Identified Compounds (TICs) (full validation only)
- System Performance (full validation only)
- Overall Assessment of Data

For the purpose of data validation, the following code letters and associated definitions were used by the data validator to summarize the data quality.

R - Reported value is "rejected." Resampling or reanalysis may be necessary to verify the presence or absence of the compound.

J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.

U J - The reported quantitation limit is estimated because Quality Control criteria were not met. Element or compound was not detected.

N J - Estimated value of a tentatively identified compound. (Identified with a CAS number.) ORGANICS analysis only.

U - The material was analyzed for, but was not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample detection limit.

NR - Result was not used from a particular sample analysis. This typically occurs when more than one result for a compound is reported due to dilutions and reanalyses.

The following subsections summarize the results of the analytical data validation according to each of the components reviewed.

4.2.6.1 Holding Times and Preservation

Analytical holding times were assessed to determine whether the holding time requirements were met by the laboratory. Preservation of the samples according to respective methods were also evaluated. Analytical and extraction holding times for all samples were within the requirements for specific analytical methods expect where noted as follows:

- For SDG H0663b, all compounds in sample H06A0 were qualified as estimated (J/UJ) because the seven-day extraction holding time was exceeded by two days (i.e., the sample was collected on August 9, 2001 and extracted on August 18, 2001). This sample was also not extracted within five days of the VTSR.

- For SDG H0664b the matrix spike and matrix spike duplicate were extracted ten days after collection, which is three days past the extraction holding time. No action was taken on QC samples.

- For SDG H0666, all compounds in samples H0667 and H06A5 were qualified as estimated (J/UJ) because the 14-day extraction holding time was exceeded by 5 to 7 days.

For preservation, all fish and benthic tissue samples were received 'cold' and 'frozen' according to the sample receipt checklist but temperatures were not recorded. For soil and sediment samples, all were received at the laboratory within the recommended temperature range of $4 \pm 2°C$.

4.2.6.2 Instrument Tuning

Instrument tuning was evaluated for the respective analyses performed. Evaluation of the gas chromatograph (GC) and mass spectrometer (MS) tune was evaluated for the analyses of PAHs by SW-846 8270C (completed by MRI for tissue samples) and for semivolatiles and PAHs by CLP SOW OLM04.2 (CLP laboratory). For each of these analyses the Decafluorotriphenylphosphine (DFTPP) instrument performance checks were run for each 12 hours of analysis. Ion abundance criteria were met and were verified from raw data for all associated DFTPP tunes. There were no problems noted.

PFK instrument tuning was evaluated for analyses of PCB congeners by Method 1668 (MRI). For each SDG evaluated, the laboratory performed the PFK tunes at the proper frequency and the PFK tunes provided by the laboratory were analyzed prior to each initial calibration. There were no problems noted.

GC and electron capture detector (ECD) instrument performance checks were evaluated for pesticide and PCB analyses completed by CLP SOW OLM04.2 (CLP laboratory). For each analyses completed, the

Resolution Check Mixture and Performance Evaluation Mixtures (PEM) were analyzed at the proper frequency. The percent difference between the calculated amount and the amount added for the individual pesticide and surrogates in the PEM standards were within 25% and the retention times were within the retention time windows. All individual and combined breakdowns met criteria. All resolution criteria for the Resolution Check Mixture, PEM standards, and individual standard mixtures were met. There were no problems noted.

4.2.6.3 Calibrations

For initial calibrations, the percent relative standard deviations (%RSDs) for all target compounds were within limits. The average relative response factors (RRFs) for all target compounds were greater than or equal to 0.05. For continuing calibrations, the percent differences (%Ds) for all target compounds were less than or equal to 25% in the associated continuing calibrations. The relative response factors (RRFs) for all target compounds were greater than or equal to 0.05. The instruments were calibrated at the required frequency. Continuing calibrations were analyzed with each 12-hour period of analysis. The following exceptions were noted:

SDG H05Y5b. The following detected and non-detected sample results were qualified as estimated (J/UJ) because the percent relative standard deviations (%RSDs) in the initial calibrations were greater than 30%:

- Atrazine in all samples. Benzaldehyde in samples H05Y5, H05Z1, H05Z2, H05Z3, H05Z4, H05Z5, H05Z6, H05Z8, H0600, H0601, H0628, H0629, H0630, and H0631

SDG H05Y5b. For the continuing calibration for SDG H05Y5b, the following detected and non-detected sample results were qualified as estimated (J/UJ) because the percent differences (%Ds) in the associated continuing calibrations were greater than 25%:

- 4-Chloro-3-methylphenol, 4-nitrophenol, butylbenzylphthalate, bis(2-ethylhexyl) phthalate, and di-n-octylphthalate in samples H05Y7, H05Y8, and H05Y9
- Benzaldehyde and atrazine in samples H05Z1, H05Z2, H05Z3, H05Z4, H05Z5, H05Z6, H05Z8, H0600, H0601, H0628, H0629, H0630, and H0631
- Benzaldehyde, bis(2-chloroethyl)ether, 2-methylphenol, 2,2'-oxybis(1-chloropropane), 4-methylphenol, n-nitroso-di-n-propylamine, hexachlorobutadiene, 4-nitrophenol, and atrazine in sample H05Y5

SDG H0663b. The following non-detected sample results were qualified as estimated (UJ) because the percent relative standard deviations (%RSDs) in the initial calibration were greater than 30%:

- Benzaldehyde and atrazine in all samples

SDG H0663b. The following non-detected sample results were qualified as estimated (UJ) because the percent differences (%Ds) in the associated continuing calibrations were greater than 25%:

- Atrazine and benzo(g,h,i)perylene in all samples
- 2,4-Dinitrophenol in all samples except H06A0
- 2,4,5-Trichlorophenol in sample H06A0

SDG H0666b. The following non-detected sample results were qualified as estimated (UJ) because the percent relative standard deviations (%RSDs) in the initial calibrations were greater than 30%:

- Benzaldehyde and atrazine in all samples

SDG H0666b. The following non-detected sample results were qualified as estimated (UJ) because the percent differences (%Ds) in the associated continuing calibrations were greater than 25%:

- Atrazine in all samples
- Benzaldehyde, 2,4-dinitrophenol, 4-nitrophenol, 4-nitroaniline, 4,6-dinitro-2-methylphenol, and butylbenzylphthalate in samples H0668, H0687, H0684, H06A1, H06A2, H06A3, and H06A4
- Benzaldehyde and 4-nitroaniline in samples H0666, H0686, H0685, H06A6, and H06A7RE
- Acetophenone, caprolactam, hexachlorocyclopentadiene, and 2,4-dinitrophenol in samples H0667 and H06A5

4.2.6.4 Blanks

Except where noted, the method blank was extracted and analyzed at the required frequency and no target compounds were reported in the method blank. The following exceptions were noted:

110158 PCB. Due to contamination found in method blanks, the following sample results were qualified as non-detected (U). The sample results were less than both the reporting limit and five times the blank concentration:

- PCB-77 in samples OG-03053, 3-OG-03286, 3-OG-03287, 3-OG-03280, and 3-OG-03039
- PCB-77 was reported in both method blanks, but only the sample results listed above required qualification. All other results were greater than five times the blank contamination.
- PCB-118 and PCB-105 were also reported in both method blanks. No action was required for these compounds, as all sample results were greater than five times the blank contamination.

HO5Y5b. Due to contamination found in one method blank, the following sample result was raised to the reporting limit and qualified as non-detected (U). The sample result was less than both the reporting limit and five times the blank concentration (10x for common laboratory contaminants):

- bis(2-Ethylhexyl)phthalate in sample H0631

HO666b. Due to contamination found in method blanks, the following sample results were raised to the reporting limit and qualified as non-detected (U). The sample results were less than both the reporting limit and five times the blank concentration (10x for common laboratory contaminants):

- bis(2-Ethylhexyl)phthalate in samples H0666, H0686, H0685, H06A6, and H06A7RE

Note: The common laboratory contaminant bis(2-ethylhexyl)phthalate was found in several other samples but was not found in the associated blank.

4.2.6.5 Surrogate Recoveries

The percent recoveries were verified from the raw data for the full validation samples. Surrogate compounds were added to the samples and the QC samples. The surrogate percent recoveries were within laboratory QC limits for all samples and the associated QC samples with the following exceptions:

110158 PAH. The recovery of surrogate 2-fluorophenol was below QC limits in six samples and the recovery of surrogate 1,2-dichlorobenzene-d4 was below QC limits in two samples. No action was taken since no more than one surrogate per fraction was outside QC limits in any sample. The recoveries of surrogates 2-fluorophenol and 1,2-dichlorobenzene-d4 were below QC limits in the method blank. No action is taken on QC samples.

110158 PCB. Internal quantitation standard compounds were added to all samples and QC samples. The following IQS recoveries were below the QC limits of 25-150% and the associated sample results were qualified as estimated (J/UJ):

- PCB-189 in sample 3-OG-03156
- PCB-169 and PCB-189 in sample 3-OG-03395

The following IQS recoveries were above the QC limits of 25-150% and the associated positive sample results were qualified as estimated (J):

- PCB-77 in sample 3-OG-03246

Re-analyses were not performed. No action is necessary.

HO663b. Surrogate compounds were added to the samples and the QC samples. The percent recovery for the surrogate terphenyl-d14 was below the QC limits of 33-141% in eight samples. No action was required because only one surrogate recovery in the base/neutral fraction was outside QC limits.

HO664b. Surrogate compounds were not analyzed for this SDG.

HO667b. Surrogate compounds were not analyzed for this SDG.

HO606p. Surrogate compounds, tetrachloro-m-xylene and decachlorobiphenyl, were added to all samples and QC samples. All surrogate recoveries were within the QC limits of 30-150% on both columns, with the following exception.

- The percent recovery of tetrachloro-m-xylene on column 2 was below the QC limits at 28% in samples H0609. No action was taken, as only one of four recoveries was outside criteria.

HO662p. Surrogate compounds, tetrachloro-m-xylene and decachlorobiphenyl, were added to all samples and QC samples. All surrogate recoveries were within the QC limits of 30-150% on both columns, with the following exception.

- The percent recovery of tetrachloro-m-xylene on column 2 was below the QC limits at 29% in samples H0690. No action was taken, as only one of four recoveries was outside criteria.

4.2.6.6 Internal Standard Criteria

The percent recoveries were verified from the raw data for the full validation samples. Summary forms were evaluated for the cursory evaluation. For all analyses except that for PCB congeners, the internal standard area counts did not vary by more than a factor of two from the associated 12-hour calibration standard. The internal standard retention times did not vary more than ± 30 seconds from the retention time of the associated 12-hour calibration standards. The following exceptions were noted:

110158 PAH. Internal standard area counts did not vary by more than a factor of two from the associated 12-hour calibration standard with the exception of internal standards chrysene-d12 and perylene-d12 in sample 3-OG-03395. Both of these compounds had area counts above the QC limit. No action was taken since the compounds quantitated using these internal standards were non-detected in this sample.

HO666b. Internal standard area counts did not vary by more than a factor of two from the associated 12-hour calibration standard with the exception of internal standards 1,4-dichlorobenzene-d4 and naphthalene-d8 in sample H06A7. Both of these compounds had area counts below the QC limit. In the reanalysis of this sample, the area count of internal standard perylene-d12 was below QC limits. As a result, the following sample results were qualified as estimated (J/UJ):

- All compounds quantitated using internal standard perylene-d12 in sample H06A7RE

Since the reanalysis of sample H06A7 had fewer qualifications than the original analysis, the results from the reanalysis should be used.

For PCB congener analysis, the Internal Quantitation Standard (IQS) compounds were added to all samples and QC samples. The IQS recoveries were within the QC limits of 25-150% with the following exceptions:

110158 PCB. The IQS recoveries were outside the QC limits of 25-150% and the associated sample results were qualified as estimated (J/UJ):

- PCB-189 in sample 3-OG-03156
- PCB-169 and PCB-189 in sample 3-OG-03395

The following IQS recoveries were above the QC limits of 25-150% and the associated positive sample results were qualified as estimated (J):

- PCB-77 in sample 3-OG-03246

Re-analyses were not performed. No action is necessary.

4.2.6.7 Matrix Spike and Matrix Spike Duplicate

The following matrix spik and matrix spike duplicate analyses was completed for each sample delivery group.

110158 PAH. The matrix spike/matrix spike duplicate (MS/MSD) analyses were not performed. No action was taken in the data validation process.

110158 PCB. MS/MSD analyses were not performed for the PCB congener analyses. No action is taken based solely on MS/MSD data. The laboratory performed duplicate laboratory control sample analyses, which are discussed in the following section.

HO5Y5b. The MS/MSD analyses were performed on samples H05Y9 and H05Z4. All percent recoveries and relative percent differences (RPDs) were within laboratory QC limits.

HO5Y5p. The MS/MSD analyses were performed on samples H0604 and H0605. All percent recoveries were within laboratory QC limits for both sets of MS/MSD analyses. The relative percent differences (RPDs) for heptachlor (35%) and aldrin (50%) were outside the laboratory QC limits in the MS/MSD analyses of sample H0605. No action is taken based solely on MS/MSD data. All RPDs were within criteria in the MS/MSD analyses of sample H0604.

HO663b. Due to limited sample volumes, the MS analysis was performed on sample H0664 and the MSD analysis was performed on sample H0665. All percent recoveries were within laboratory QC limits. However, relative percent differences (RPDs) could not be calculated since two different samples were used.

HO664b. Due to limited sample volumes, the MS analysis was performed on sample H0664 and the matrix spike duplicate analysis was performed on sample H0665. All percent recoveries were within laboratory QC limits. However, relative percent differences (RPDs) could not be calculated since two different samples were used.

HO666b. The MS/MSD analyses were performed on sample H0686. All percent recoveries were within laboratory QC limits with the exception of n-nitroso-di-n-propylamine and pyrene, which had recoveries below QC limits in the matrix spike analysis. All nine MS compounds had relative percent differences (RPDs) outside QC limits. No action is taken based solely on MS/MSD results.

HO667b. The MS/MSD analyses were performed on sample H0686. Anthracene and pyrene were used as the spiking compounds. The recovery for pyrene was below QC limits in the MS analysis. Both MS compounds had relative percent differences (RPDs) outside QC limits. No action is taken based solely on MS/MSD results.

HO669p. The MS/MSD analyses were performed on sample H0669. All percent recoveries and RPDs were within laboratory QC limits.

HO606p. The MS/MSD analyses were performed on sample H0608. All percent recoveries and RPDs were within laboratory QC limits. No calculation errors or transcription errors were found.

HO618p. The MS/MSD analyses were performed on sample H0618. All percent recoveries and RPDs were within laboratory QC limits.

H0662p. The MS/MSD analyses were performed on sample H0662. All percent recoveries and RPDs were within laboratory QC limits. No calculation errors or transcription errors were found.

4.2.6.8 Blank Spikes (Laboratory Control Samples)

For CLP analyses (PAHs, pesticides and PCBs) laboratory control sample (LCS) analysis was not performed as it is not required for the CLP analyses. Pesticide cleanup checks are, however, required. For all CLP pesticide and PCB samples, the pesticide florisil cartridge check analysis was performed according to requirements and all spike recoveries were within 80-120%. For all samples, the pesticide gel permeation chromatography (GPC) calibration verification was performed according to requirements and all spike recoveries were within 80-110%.

For PAH analyses completed by MRI, a laboratory control sample (LCS) and a laboratory control sample duplicate (LCSD) were analyzed. All PAHs were included in the LCS and LCSD analyses. The laboratory did not indicate that any control samples were outside QC limits. No action was taken.

For PCB congener analyses completed by MRI, an LCS and LCSD analyses were completed. All relative percent differences (RPDs) were within laboratory QC limits with the following exceptions:

- The LCS/LCSD percent recoveries for PCB-118 (137%/157%, 149%/150%) in both extraction batches were above the QC limits of 75-125%. Additionally, the recoveries of PCB-157 (127%) in the LCS analysis and PCB-77 (126%) in the LCSD analysis from Batch 2 were above the QC limits. No action was taken by the data validators based on LCS/LCSD data.

4.2.6.9 Target Compound Quantitation and Reporting Limits (Full Validation Only)

The following evaluation and results were completed for the target compound quantitation and reporting limits for those samples undergoing full validation only. The results are reported according to SDG. Except where noted, no calculation or transcription errors were found and the reporting limits were correctly reported.

110158 PAH. Compound quantitation and reporting limits were evaluated for full validation sample 3-OG-03084. No positive results were reported for this sample. No calculation or transcription errors were found.

110158 PCB. The results for PCB-77 in the full validation sample 3-OG-03060; PCB-81, PCB-123, PCB-126, and PCB-169 in the full validation sample 3-OG-0333; and PCB-114 in the full validation sample 3-OG-03286 were flagged "E" by the laboratory and reported as estimated maximum potential

concentration. This indicates a peak was detected but did not meet qualitative identification criteria and was not reported as a non-detected result. No action was taken for these compounds.

The following result was flagged S" by the laboratory, indicating the detector was saturated for this compound. The ion ratio for this compound was not met due to the saturation. As a result, this result was qualified as estimated (J) in the full validation sample:

- PCB-118 in sample 3-OG-03060

HO5Y5b. Compound identification was evaluated for full validation samples H05Y7, H05Y8, and H0600. Sample relative retention times (RRTs) were within ± 0.06 RRT units of the standard RRT. Ions present in the standard mass spectrum at a relative intensity greater than 10% were present in the sample spectrum. Relative intensities of ions agreed within ± 30% between standard and sample spectra.

Tentatively identified compounds (TICs) were evaluated for full validation samples H05Y7, H05Y8, and H0600. The sample spectra and library searches were evaluated. TIC results were recalculated and found to be correct. All identified compounds for these samples were reported with the "NJ" qualifier. All TICs, which were also present in the method blanks, were flagged "B" by the laboratory.

HO663b. Compound identification was evaluated for full validation samples H0663 and H0679. Sample relative retention times (RRTs) were within ± 0.06 RRT units of the standard RRT. Ions present in the standard mass spectrum at a relative intensity greater than 10% were present in the sample spectrum. Relative intensities of ions agreed within ± 30% between standard and sample spectra.

Tentatively identified compounds (TICs) were reported for full validation sample H0679. The sample spectra and library searches were evaluated. TIC results were recalculated and found to be correct. All identified compounds were reported with the "NJ" qualifier.

HO664b. Target compound identification was evaluated for full validation samples H0680 and H0683. Sample relative retention times (RRTs) were within ± 0.06 RRT units of the standard RRT. Ions present in the standard mass spectrum at a relative intensity greater than 10% were present in the sample spectrum. Relative intensities of ions agreed within ± 30% between standard and sample spectra.

Samples H0680 and H0681 were analyzed at 5X dilutions based on anticipated levels of target compounds. The reporting limits were raised accordingly. Due to sample results reported over the calibration range, the following results were qualified as estimated (J):

- Naphthalene in samples H0683 and H0699
- Acenaphthene in samples H0680 and H0681

Note: Acenaphthene and pyrene were over the calibration range in the MS/MSD analyses. No action is taken on QC samples.

HO667. Compound identification was evaluated for full validation samples H0666 and H0687. Sample relative retention times (RRTs) were within ± 0.06 RRT units of the standard RRT. Ions present in the standard mass spectrum at a relative intensity greater than 10% were present in the sample spectrum. Relative intensities of ions agreed within ± 30% between standard and sample spectra.

Due to results reported above the calibration range, the following sample results were qualified as estimated (J):

- Fluoranthene in sample H0684
- Anthracene in sample H0685

HO606p. Compound quantitation and reporting limits were evaluated for the full validation samples. The results for endrin aldehyde and gamma-chlordane in samples H0606 and H0627 were flagged "P" by the laboratory, indicating the difference in the column results were greater than 25%. As a result, these sample results were qualified as estimated "J" in the full validation samples H0606 and H0627.

H0662p. Compound identification was evaluated for the full validation samples. All detected results were confirmed by analysis on a second column. Compound quantitation and reporting limits were evaluated for the full validation samples. All final results were reported from the lowest results. No calculation or transcription errors were found.

The results for endrin aldehyde in sample H0690 and for Aroclor-1260 in samples H0670 and H0690 were flagged "P" by the laboratory, indicating the difference in the column results were greater than 25%. As a result, these sample results were qualified as estimated "J" in the full validation samples H0670 and H0690.

4.2.6.10 System Performance (Full Validation Only)

System performance was evaluated for each of the full validation samples. The following subsections by SDG report the results.

110158 PAH. The full validation sample 3-OG-03084 was evaluated for reconstructed ion chromatogram baseline shifts, extraneous peaks, loss of resolution, and peak tailing. No system degradation was noted.

110158 PCB. The full validation samples were evaluated and no system problems were noted.

HO5Y5b. The full validation samples H05Y7, H05Y8, and H0600 were evaluated for reconstructed ion chromatogram baseline shifts, extraneous peaks, loss of resolution, and peak tailing. No system degradation was noted.

HO663b. The full validation samples H0663 and H0679 were evaluated for reconstructed ion chromatogram baseline shifts, extraneous peaks, loss of resolution, and peak tailing. No system degradation was noted.

HO664b. The full validation samples H0680 and H0683 were evaluated for reconstructed ion chromatogram baseline shifts, extraneous peaks, loss of resolution, and peak tailing. No system degradation was noted.

HO667b. The full validation samples H0666 and H0687 were evaluated for reconstructed ion chromatogram baseline shifts, extraneous peaks, loss of resolution, and peak tailing. No system degradation was noted.

4.2.6.11 Overall Assessment of Data

The data was considered acceptable from each laboratory and SDG with the exceptions noted in the above sections. The following sections summarized by SDG describe the overall assessment.

110158 PAH. The data in this laboratory batch are acceptable and remain unqualified.

110158 PCB. The fish tissue sample 3-OG-03133 was received at the laboratory, but was not listed on the chain-of-custody records. The collection date for this sample was taken from the analytical results table.

The sediment sample 3-OG-03237 was received broken. The bottom of the glass container was cracked, but the sample had not leaked into the plastic bag. This sample was transferred into a new glass container.

HO5Y5b. The data in this laboratory batch were acceptable and remained unqualified with the exceptions noted above.

HO5Y5p. The data in this laboratory batch are acceptable and remain unqualified. According to the case narrative, samples H05Z7, H05Z9, and H0603 were received broken at the laboratory. The client was notified and the sample analyses were canceled.

HO663b. The data in this laboratory batch were acceptable and remain unqualified with the exceptions noted above.

HO664b. The data in this laboratory batch were acceptable and remained unqualified with the exceptions noted above.

HO666b. The data in this laboratory batch are acceptable and remain unqualified with the exceptions noted above. Since the reanalysis of sample H06A7 had fewer qualifications than the original analysis, the data validators recommended that the results from the reanalysis should be used.

HO667b. The data in this laboratory batch are acceptable and remain unqualified with the exceptions noted above.

HO669p. The data in this laboratory batch are acceptable and remain unqualified. Although the case narrative indicated the samples were water samples, the chain-of-custody records and Form 1s indicated the samples were soil samples.

HO606p. The data in this laboratory batch are acceptable and remain unqualified with the exceptions noted above.

HO618p. According to the case narrative, sample H0635 was received broken at the laboratory. The client was notified and the sample analysis was canceled.

H0662p. The data in this laboratory batch are acceptable and remain unqualified with the exceptions noted above.

5.0 SEDIMENT SAMPLING

Sediment samples were collected for both chemical analysis and for sediment toxicity testing.

5.1 Sediment Collection

Table 5-1 summarizes the sediment field samples collected from the Ogden River, the Pioneer Power Plant aqueduct, the Wall Avenue storm drain, the 21st Street Pond, the Weber River and the Buena Ventura Park Pond in July and August of 2001. Sediment samples were collected per SOP# SRC-OGDEN-04 *Sediment Sampling*. It was necessary to collect most sediment samples using a tulip bulb planter or a stainless steel scoop from stream locations. A petite ponar dredge was used from a boat for deeper water conditions (Buena Ventura Park Pond, the 21st Street Pond and Reach 14 of the Weber River). Sample depth was typically 0 to 6 inches when using the petite ponar and 0 to 4 inches when using the tulip bulb planter. It was necessary to composite sediment from several collocated grabs in a stainless steel bucket to obtain sufficient material to meet analytical requirements. The grab samples were mixed thoroughly and sieved. Aliquots for laboratory analyses were dispensed into appropriate sample containers. All unused sediment material was returned to the collection site. .

As noted in the field log book, several samples taken from the 21st Street Pond appeared to be visibly impacted by DNAPL. Samples 21SP-04P and 21SP-04K (within fenced area) and sample 21SP-04R (just outside of the fence in the pond) had a petroleum-type odor, and the sediments appeared to have a sheen with speckles of black oily substance. Of these stations, sediments from 21SP-04P appeared to be most impacted of all 21st Street Pond locations.

In addition, the observation of a sheen in the Ogden River was noted at sample location OGR-03B (informally referred to as the "Baby Doll seep") during the July 2001 sampling. This rainbow-like sheen appeared for a short period of time after sediments were disturbed with a stick. At this time, USEPA has not taken any additional steps to determine if the sheen observed is indicative of DNAPL contamination at this location.

5.2 Sediment Analysis

Depending on the sampling location, sediment samples were analyzed for semivolatiles, PAHs by SIM, PCB Aroclors, PCB congeners and TOC. As indicated in Table 5-1, one additional sediment sample was archived at some sampling stations for possible future analysis of PCB congeners.

5.2.1 Semivolatiles and PAHs

5.2.1.1 Semivolatiles

The results of the analysis of sediment samples for semivolatiles using the CLP laboratory and procedures are provided in Table 5-2. The sampling locations were depicted in Figure 2-2. Raw data are provided in Appendix C. There were 19 semivolatile compounds detected in sediments from the 21st Street Pond compared to one compound detected in either of the Buena Ventura Park Pond sediment samples. The highest concentrations of semivolatile compounds were detected in sediment samples from 21st Street Pond locations 21SP-Ka (seep bank within fenced area), 21SP-04P (inside the fenced area) and 21SP-04R (just outside the fenced area). Semivolatile compounds were rarely or never detected by the CLP method at 3 of the 4 seepage bank areas sampled to the northwest of the fenced area (21SP-04Ma & b, 21SP-04O and 21SP-04T). However, nine semivolatile compounds were detected in one seepage bank sample to the

northwest of the fenced area (21SP-04L). All but one of these compounds (4-methylphenol) were also detected in the sediment samples within the fenced area. Thirteen semivolatile compounds were detected in the sediment samples collected from the Ogden River. Similar concentrations and compounds were detected upstream and downstream of the DNAPL zone (Table 5-2).

5.2.1.2 PAHs by Selective Ion Monitoring (SIM)

The results of the analysis of sediment samples for PAHs by the SIM method are presented in Table 5-3. The SIM analysis was only completed for PAHs and not all semivolatile compounds. The SIM method provided detection limits that were approximately 10 fold lower than the CLP method results provided in Table 5-2. As seen, for two samples from the 21st Street Pond near the fenced area (21SP-04P and 21SP-04R) PAH concentrations were too high to perform SIM analysis. Measured PAH concentrations were highest within the fenced area of the 21st Street Pond (21SP-04Ka) and in the Ogden River at stations potentially impacted by the DNAPL zone (OGR-03B and -03D). These results will be interpreted further in the baseline risk assessments.

5.2.2 PCBs

5.2.2.1 PCB Aroclors

The results of the analysis of sediment samples for pesticides and PCB Aroclors are provided in Table 5-4. The raw data are included as part of Appendix C. Figure 5-1 shows the concentrations of PCB Aroclors detected at each sediment sampling location in an upstream to downstream direction along the Ogden River. Concentrations are also provided on an TOC normalized basis.

PCB Aroclors were detected downstream of the Pioneer Power Plant aqueduct, in the Wall Avenue Storm Drain, in the Ogden River adjacent to and downstream of the 21st Street Pond, and in the 21st Street Pond. PCB Aroclors were not detected in any of the sediment samples from the Weber River or Buena Ventura Park Pond.

5.2.2.2 PCB Congeners

The results of the analysis of sediment samples for PCB congeners are provided in Table 5-5. The raw data are included as part of Appendix C. It is important to note that congener analysis was only performed for 12 of the 209 PCB congeners thought to be of toxicological significance. Therefore, the sum of the concentration of these 12 PCB congeners will not necessarily equal the total PCB concentration. Figure 5-2 provides a graphical summary of the PCB congener results by sampling location. Figure 5-3 plots the PCB congener concentrations measured in sediment in comparison to concentrations measured in other media (these media will be discussed in more detail in subsequent sections).

Initially, PCB congeners were analyzed for in 3 sediment samples; from the 21st Street Pond (21SP-04R), Reach 3 of the Ogden River (OGR-03C) and Reach 5 of the Ogden River (OGR-05B). After review of the initial PCB congener results, a second round of analysis was performed for 6 additional sediment samples; three from the Ogden River, one from Buena Ventura Park Pond, one from the Pioneer Power Plant Aqueduct, and one from the Wall Avenue Storm Drain. As seen at OGR-03C, PCBs were detected in the sediment sample based on the PCB congener analysis method but were not detected based on the PCB Aroclor method (see Table 5-4). This is not surprising since the detection limits for the congener method were 1000 times lower than those for the Aroclor method (ppt vs ppb).

5.2.3 Total Organic Carbon (TOC)

Analysis of TOC was performed for most sediment and soil samples collected during the Phase 3 investigation by Analytical Method 9060. The results of the TOC analysis of sediment samples are provided in Table 5-6. The raw data are included as part of Appendix C. As seen, TOC varied widely ranging from 1.7 to 53.5 g/kg with an average TOC of about 20 g/kg.

5.3 Sediment Toxicity Testing

Sediment was collected from five sampling locations for sediment toxicity testing with the amphipod (*Hyalella azteca*). The toxicity data will be used in the ecological risk assessment as part of the evaluation of risks for benthic invertebrates. The results of the testing are reported in Appendix E. Sediments were collected from three sampling locations in the 21st Street Pond. One location was inside the fenced area (21SP-04P), one just outside the fenced area (21SP-04R) and one to the northwest of the fenced area (21SP-04T). Samples were also collected from two reference locations in the Buena Ventura Park Pond.

The sediment samples were tested using the *Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates*, Test Method 100.1 (USEPA 1994) and ASTM Guideline E 1706-95b *Standard Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Fresh Water Invertebrates* (ASTM, 1997) as outlined in Appendix E.

Sediment toxicity tests indicate that none of the 21st Street Pond samples resulted in toxicity to H. azteca above that seen in Buena Ventura Park Pond or the laboratory control sample (Table 5-7). These results will be interpreted further and included in the weight of evidence for the evaluation of risks to benthic invertebrates in the ecological risk assessment.

6.0 GROUNDWATER FLUX MEASUREMENT

If chemicals from the DNAPL zone are impacting the Ogden River, it is likely that the area of greatest impact will be in locations where the groundwater is flowing into the river ("gaining") rather than in locations where water is flowing from the river to the groundwater ("losing"). While hydrogeologic studies can define overall trends in water flow, these patterns can vary over small distances, and can vary from time to time. Thus, direct measurement of the direction of water flow (gaining, losing) are needed to evaluate the results at any particular location selected for sampling.

Groundwater flux was measured according to the procedures detailed in SOP# SRC-OGDEN-06 *Groundwater Flux Sampling* (USEPA, 2001b). A positive flux measurement (static level above water level) indicates that the groundwater is moving towards the surface water body, or the surface water body is "gaining" groundwater. A negative flux measurement (static level below water level) indicates that the groundwater is moving away from the surface water body, or the surface water body is "losing" water to the groundwater. Table 6-1 presents a summary of all groundwater flux measurements. In general, the reach of the Ogden River over the DNAPL zone (Reach 3) was found to be losing to groundwater.

The sampling locations, in general, correlate with those used for analytical sampling (Figure 2-2). With the exception of two locations, the Ogden River (Reach 3) was found to be losing to groundwater or even. There were two locations (OGR-03D and OGR-03B) in which one the flux measurements taken on different dates at the location was found to be gaining groundwater. One location, OGR-03D, had visible evidence of seepage. These measurements may indicate that some very localized areas of the Ogden River are gaining groundwater periodically. All flux measurements made in the 21st Street Pond were found to be gaining groundwater. The flux information collected is provided on the field log sheets in Appendix A.

7.0 SEDIMENT PORE WATER SAMPLING

Sediment pore water was sampled from the Ogden River and the 21st Street Pond at locations that may be potentially impacted by the DNAPL zone. The sampling procedure used for collecting pore water is detailed in SOP# SRC-OGDEN-01 *Pore Water Sampling* included as part of the Phase 3 SAP. Samples were collected with either a 14 inch or 27 inch micro push point sampler depending upon the water depth and bottom substrate at the respective sampling location.

The field pore water samples collected and associated analyses are summarized in Table 7-1. As seen, samples were collected from the following locations five locations at the 21st Street Pond (4K through 4O) and at three locations on the Ogden River (3B through 3D). All samples were analyzed for semivolatiles by the CLP method. Samples collected in August 2001 were also analyzed for PAHs using the SIM method. Pore water samples collected during the July 2001 sampling event (as described in Section 4.2.4) were not analyzed for PAHs by the SIM method as planned. These samples, however, were analyzed for semivolatiles by the CLP method. It was necessary to recollect these samples during the August sampling event to accomplish the SIM analyses (as described in Section 4.2.4) and as part of this analytical process the semivolatile analyses by the CLP method was repeated. This resulted in a greater number of samples analyzed for semivolatiles than planned.

7.1 Semivolatile by CLP Method

The results of the analysis of pore water samples for semivolatiles by the CLP method are provided in Table 7-2. Raw data are provided in Appendix C. Eleven semivolatile compounds were detected in porewater samples from the 21st Street Pond. Concentrations are highest at the sampling locations inside the fenced area (21SP-04Ka and -04N) at the 21st Street Pond. Fewer compounds at lower concentrations are found at sampling locations outside of the fenced area. There are, however, some compounds detected at the northwest seep locations (21SP-04L, -04M and -04O). With the exception of acetophenone and bis(2-ethylhexyl)phthalate, all chemicals were below the detection limit in all Ogden River samples.

7.2 PAHs by SIM Method

The results of the analysis of sediment samples for PAHs by the SIM method, are provided in Table 7-3. The SIM method provided detection limits that were approximately 10 fold lower than the CLP method (Table 7-2). Twelve different PAHs were detected in the pore water samples from the 21st Street Pond and 3 PAHs were detected in the pore water samples from the Ogden River. By the SIM method, the PAH concentrations are highest at 21SP-04N located within the fenced area. Similar compounds (acenaphthene, anthracene, benzo(a)anthracene, benzo(b)fluoranthene, fluoranthene, fluorene, naphthalene, phenanthrene, and pyrene) were detected at 21st Street Pond locations within the eastern fenced area of the DNAPL compared to those located at seep areas to the northwest. Acenapthene, fluorene, and naphthalene were detected at location OGR-03B in the Ogden River.

8.0 SURFACE SOIL SAMPLING

Surface soil samples were collected from six locations in an abandoned meander of the Ogden River adjacent to the 21st Street Pond (21SP-04A through 21SP-04F in Figure 2-2). Soil samples were collected according to the detailed procedures in SOP# SRC-OGDEN 02, *Surface Soil Sampling* from the Phase 3 SAP. In general, surface soil (0 to 4 inches) was collected using a stainless steel hand trowel and was composited from several co-located grabs into a stainless steel bucket to obtain sufficient material to meet analytical requirements. The sample was thoroughly mixed and sieved and aliquots for laboratory analysis were dispensed into appropriate sample containers. All unused soils were returned to the collection site. All soil samples were analyzed for pesticides and PCB Aroclors by the CLP method. One split sample from each location was held for possible analyses of PCB congeners.

The results of the analysis of surface soil samples for pesticides and PCB Aroclors are provided as Table 8-1. PCB Aroclor 1260 was detected in five of six soil samples at concentrations ranging from 51 to 550 ug/kg. These concentrations within the abandoned river channel are higher than those measured in sediments the Ogden River or 21st Street Pond (Figure 5-1). Also detected were three pesticides 4,4'-DDT, endrin aldehyde and gamma chlordane. These data will be further evaluated and used in the baseline risk assessments.

9.0 BENTHIC MACROINVERTEBRATE AND DRIFT SAMPLING

9.1 Tissue Analysis

Concentrations of PAHs and PCBs in the tissues of benthic invertebrates that reside in the sediments are of interest, both as an index of exposure and risk to the invertebrates as well as a source of exposure and risk to organisms that feed on the invertebrates. In general, PAHs do not have a tendency to bioaccumulate in biotic tissue (USEPA, 2000; Eisler, 1987).

Benthic invertebrate collection followed the procedures presented in SOP# SRC-OGDEN-09, *Benthic Macroinvertebrate Sampling and Processing* contained in the Phase 3 SAP. Sampling locations were situated in areas that typify the drainage and were likely to yield representative specimens. Benthic invertebrates were collected primarily by kick netting. Collected organisms were placed in plastic bags on ice and organisms were removed from substrate by hand using forceps and placed in containers for shipment to the laboratory. Containers were filled so that the weight of the organisms exceeded 12 grams wet weight.

Table 9-1 summarizes the benthic tissue samples collected and the intended analysis of each sample.

9.1.1 PAHs

Table 9-2 provides the results of the analyses of PAHs in benthic invertebrate tissues. PAHs were not detected in any of the tissue samples above the detection limit.

9.1.2 PCB Congeners

Table 9-3 provides the results of the analyses of PCB congeners in benthic invertebrate tissues. PCB congeners were detected in each sample analyzed. These results are graphed in relationship to the concentrations measured in other media by sampling location in Figure 5-3. The results will be further interpreted and used to assess risks in the baseline ecological risk assessment.

9.2 Drift Samples

One sample of drift material was collected at the inflow culvert of the 21st Street Pond for the analysis of PCB congeners. The sample was collected using a conical shaped tow-net approximately 12 inches in diameter that was anchored to the pond bank and placed in the water column immediately in front of the inflow culvert (see Figure 2-3). After 24 hours, large debris such as sticks or leaves were removed, and the drift material was removed from the net and placed in the appropriate container for transport to the laboratory for analyses. The results of the analyses of PCB congeners in the drift material are included in Table 9-3 and Figure 5-3. The results will be further interpreted and used to assess risks in the baseline ecological risk assessment.

9.3 Community Evaluation (Taxonomic Identification)

Benthic invertebrate samples were collected at seven locations during the August 2001 sampling event for the purpose of qualitatively identifying the benthic community. Samples were collected from three locations at the 21st Street Pond (4Q, 4R, and 4T), two locations at the Buena Ventura Park Pond (8A and 8B), one location on the Ogden River (5B), and one location on the Weber River (14C).

Benthic organisms were collected systematically from all available in-stream habitats by the use of kick netting. Samples were preserved in 95% isopropyl alcohol, processed and identified by a subcontract laboratory. Benthic community results are provided in Table 9-4 and detailed results as submitted by the subcontract laboratory are in Appendix F. These results will be interpreted further and included in the weight of evidence for the evaluation of risks to benthic invertebrates in the ecological risk assessment.

10.0 FISH SAMPLING

10.1 Fish Collection

Fish were collected and analyzed from the Ogden and Weber Rivers, Buena Ventura Park Pond, and 21st Street Pond as identified in the Phase 3 SAP. Fish collection was accomplished by use of a subcontractor. The field log book for fish collection is included in Appendix A. In areas of shallow water, a backpack electroshocker with a trailing negative and five mobile positive electrode was used. In the deeper waters (non-wadable), a boat mounted Model VVP2C-2000 and throwing anode was employed. Sampling was performed at each station until the desired number and species of fish were met. In general, approximately 15 to 20 forage fish, 20 game fish, and 10 non-game fish were collected from each station. Fish were identified, measured, and weighed in accordance with the procedures described in SOP# SRC-OGDEN-03, *Fish Collection and Processing*. The fish were collected under a permit with the Division of Wildlife Resources in Salt Lake City, Utah. The report of activities for collection, salvage or banding of fish was provided to the Department as required by the permit. A copy of this report is attached as Appendix G. If possible, at each location the following samples were prepared:

- 20 forage fish - whole body, composite
- 10 game fish - fillets, composite
- 10 game fish - carcasses (remaining from fillets), composite
- 10 game fish - whole body, individual
- 10 non-game fish - whole body, individual

All fish samples were wrapped in aluminum foil, labeled, placed into two Ziploc® bags, and stored on wet and dry ice. Only a subset of the samples collected during the August 2001 sampling event were analyzed for PCB/dioxin congeners or PAH content. Most samples are currently on hold for possible future analysis. A summary of all fish samples collected and the intended analyses is provided in Table 10-1. Table 10-2 provides detailed information for the fish samples submitted for analysis including number of individuals in composite samples, fish species, weight, length.

10.2 Analysis of Fish Tissue

Fish samples were submitted to MRI laboratory and analyzed for PAHs, PCB congeners and dioxin congener as described in the previous subsection. The report summarizing the results of the tissue analyses issued by MRI is included as part of Appendix C.

10.2.1 PAHs

Table 9-2 provided the results of the analysis of PAHs in fish tissues. PAHs were not detected in any of the tissue samples above the detection limit.

10.2.2 PCB and Dioxin Congeners

Table 10-3 provides the results of the analyses of PCB and dioxin congeners in fish tissue samples. PCB congeners were detected in each sample analyzed, dioxin congeners were not detected in any sample. The PCB results are graphed in Figure 10-1 from upstream to downstream for the Ogden River and 21st Street Pond and Weber River. Figure 5-3 provides a summary of PCB congener concentrations in fish tissue compared to concentrations in other media for each sampling location. These results will be further interpreted and used to assess risks in the baseline risk assessments. Some general observations of the data

include:

- There does not appear to be a relationship between the PCB Aroclor concentrations in sediment and PCB congener measurements in sediment or fish fillet tissue.
- The pattern of PCB congener contamination in fish fillet tissue and the few sediment samples analyzed are similar across all samples with PCB 118 > PCB 105 > PCB 156 > PCB 167 > PCB 189. This suggests either a similar source or a similar weathering pattern for PCBs regardless of source.
- The concentrations of PCB congeners in fish fillet samples and PCB Aroclors in sediment suggests higher contaminant levels in the Ogden River and 21st Street Pond relative to the Weber River.

11.0 REFERENCES

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TARGET SHEET

EPA REGION VIII

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SITE NAME: OGDEN RAILROAD YARD

DOCUMENT DATE: 10/01/2002

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DOCUMENT DESCRIPTION:

TABLES Phase 3 Field Investigation Summary Report July/August 2001
(See Table of Contents)

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FIGURES

Phase 3 Field Investigation Summary Report
July and August 2001
Ogden Railyard Site, Ogden, Utah

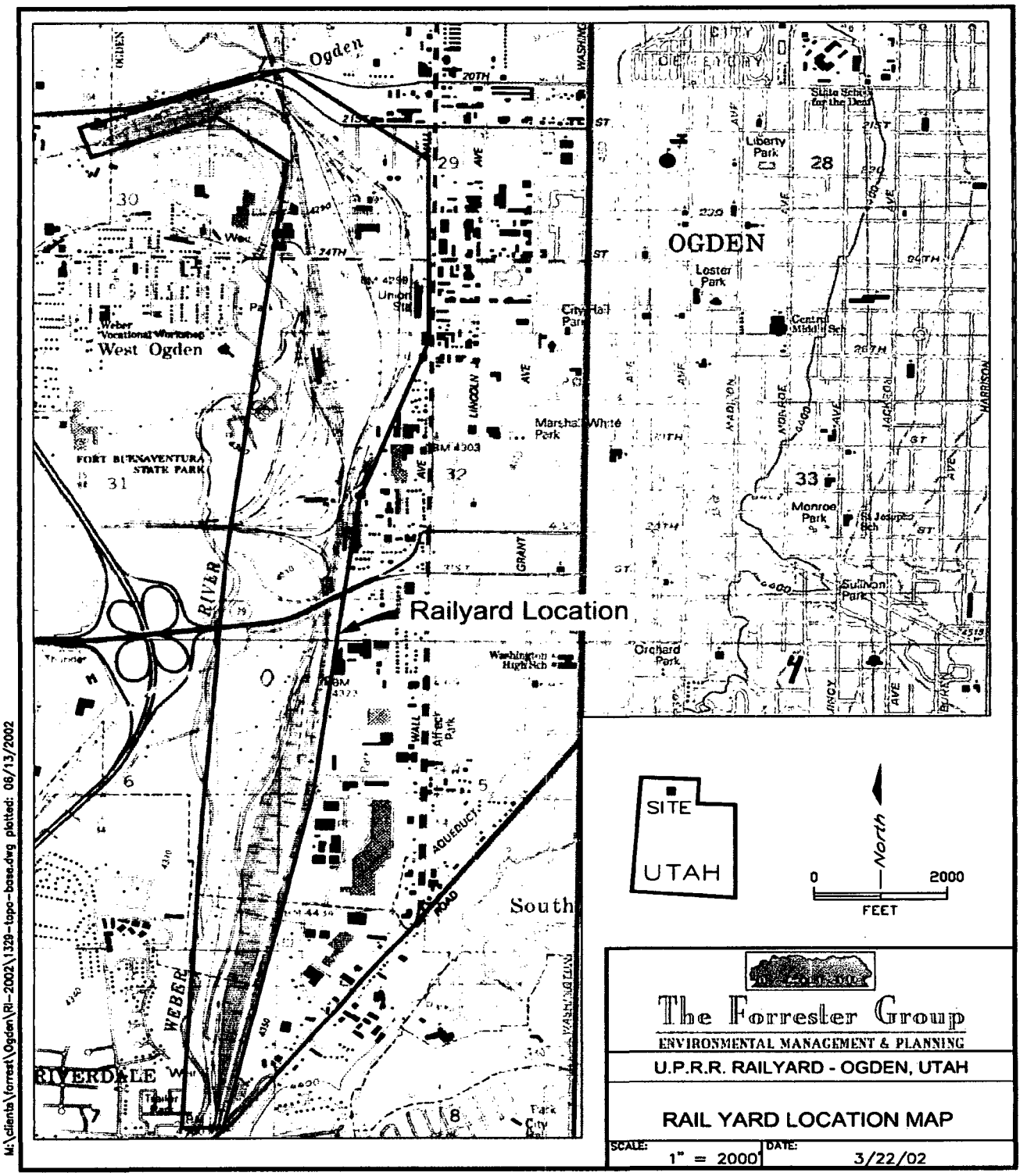


Figure 1-1
Ogden Railyard Location Map

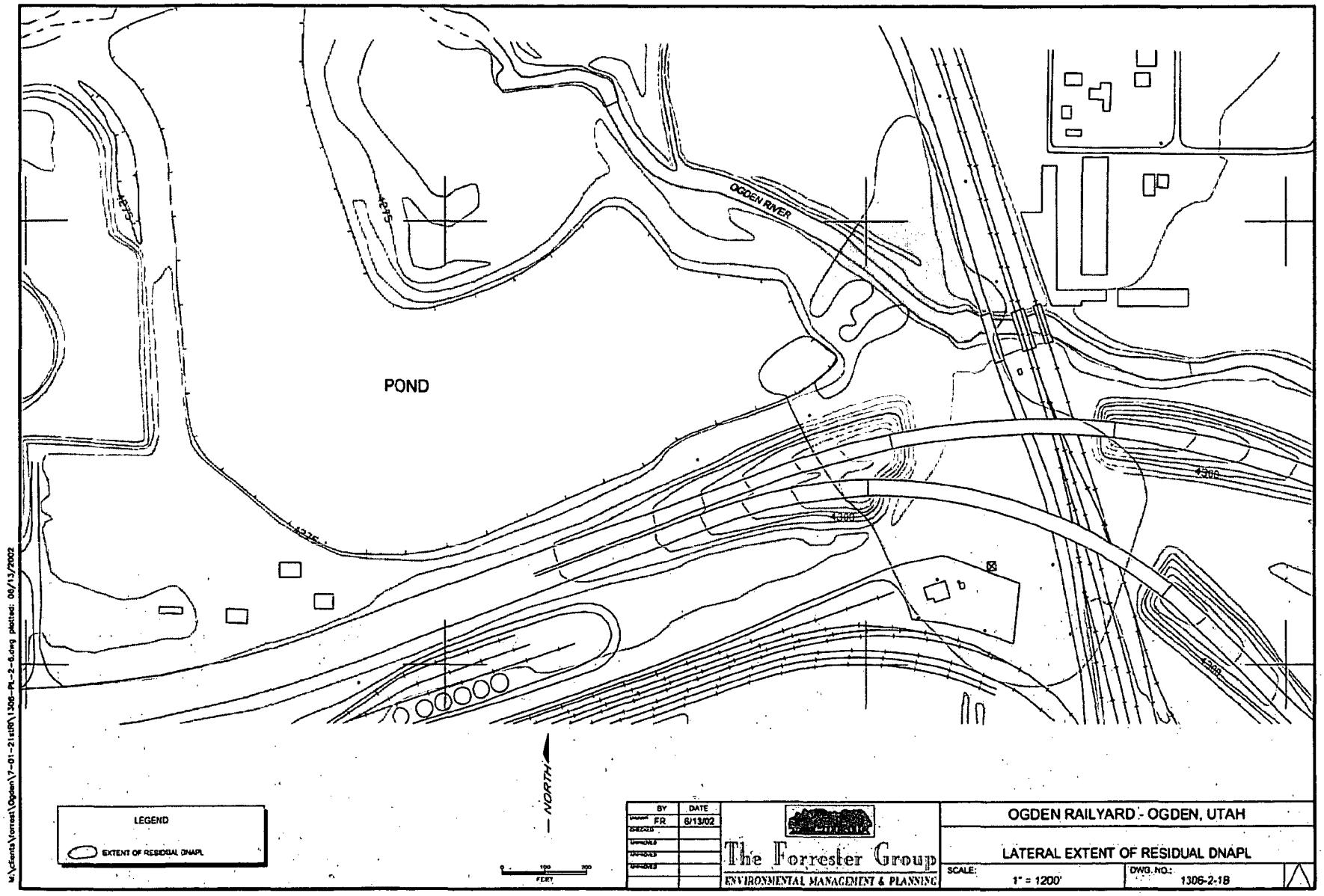


Figure 1-2
Location of the DNAPL Zone

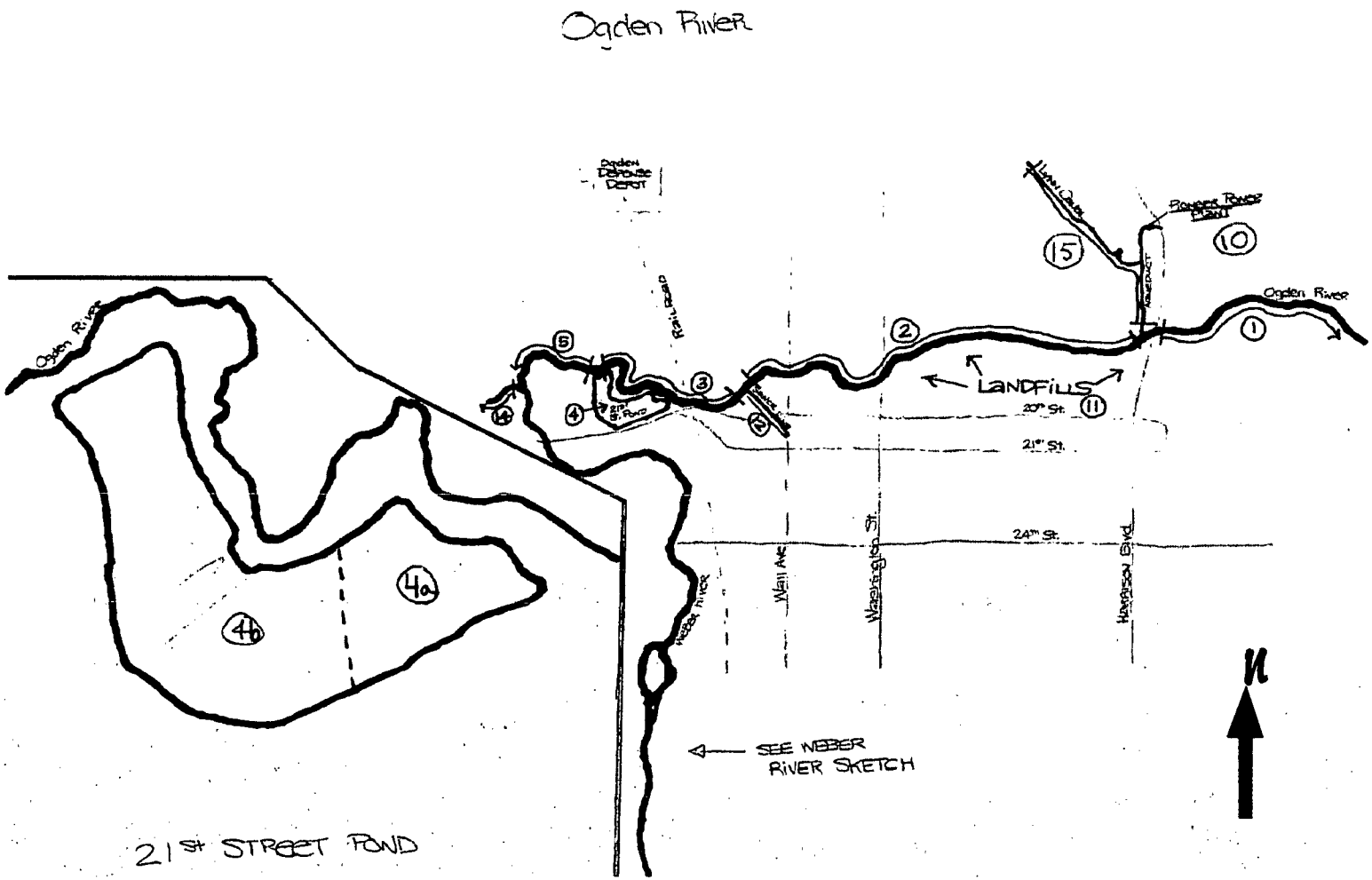
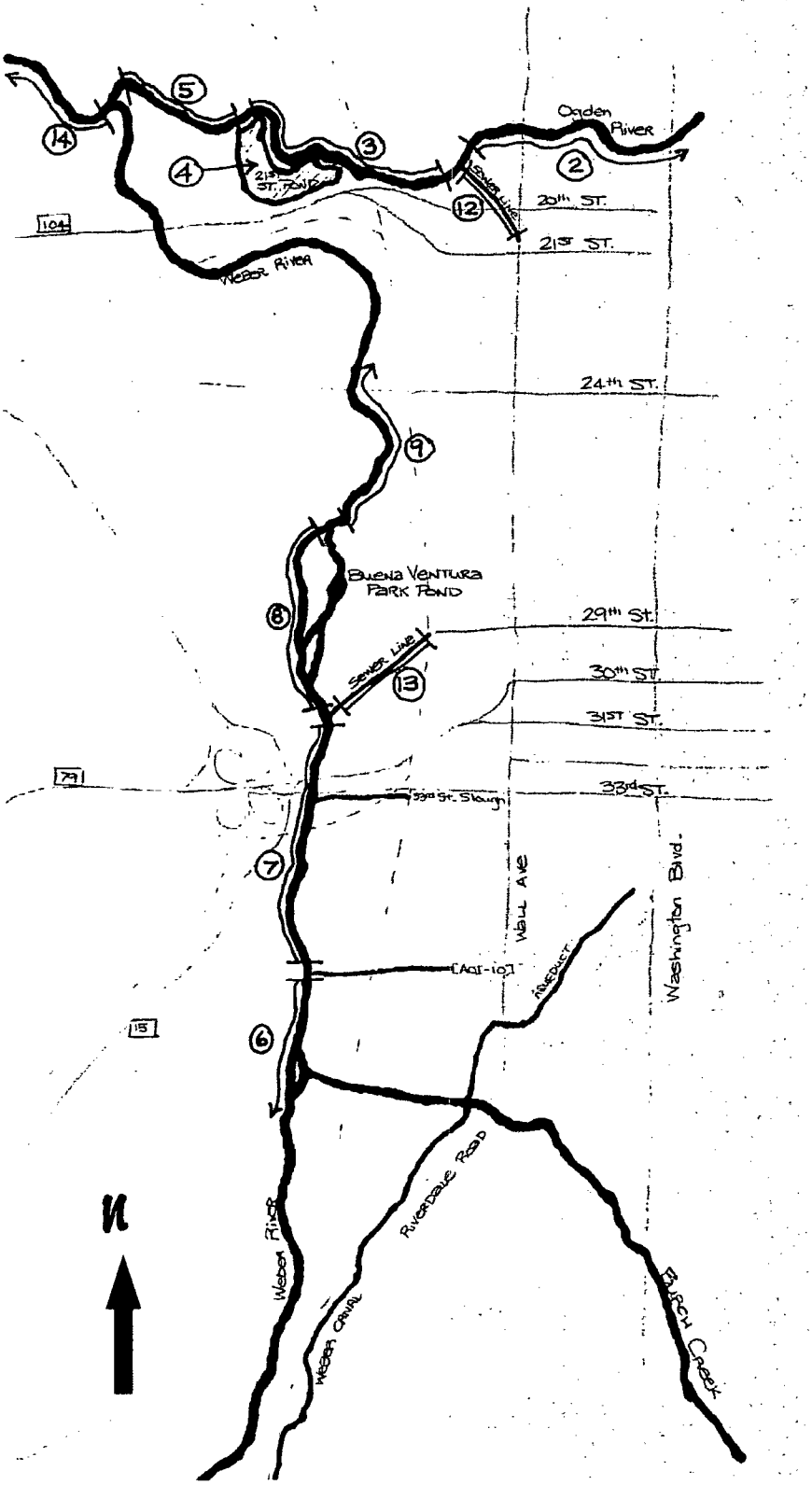


FIGURE 2-1a. MAP OF SAMPLING LOCATIONS OGDEN RIVER AND 21st STREET POND

FIGURE 2-1b. MAP OF SAMPLING LOCATIONS
WEBER RIVER



Color Map(s)

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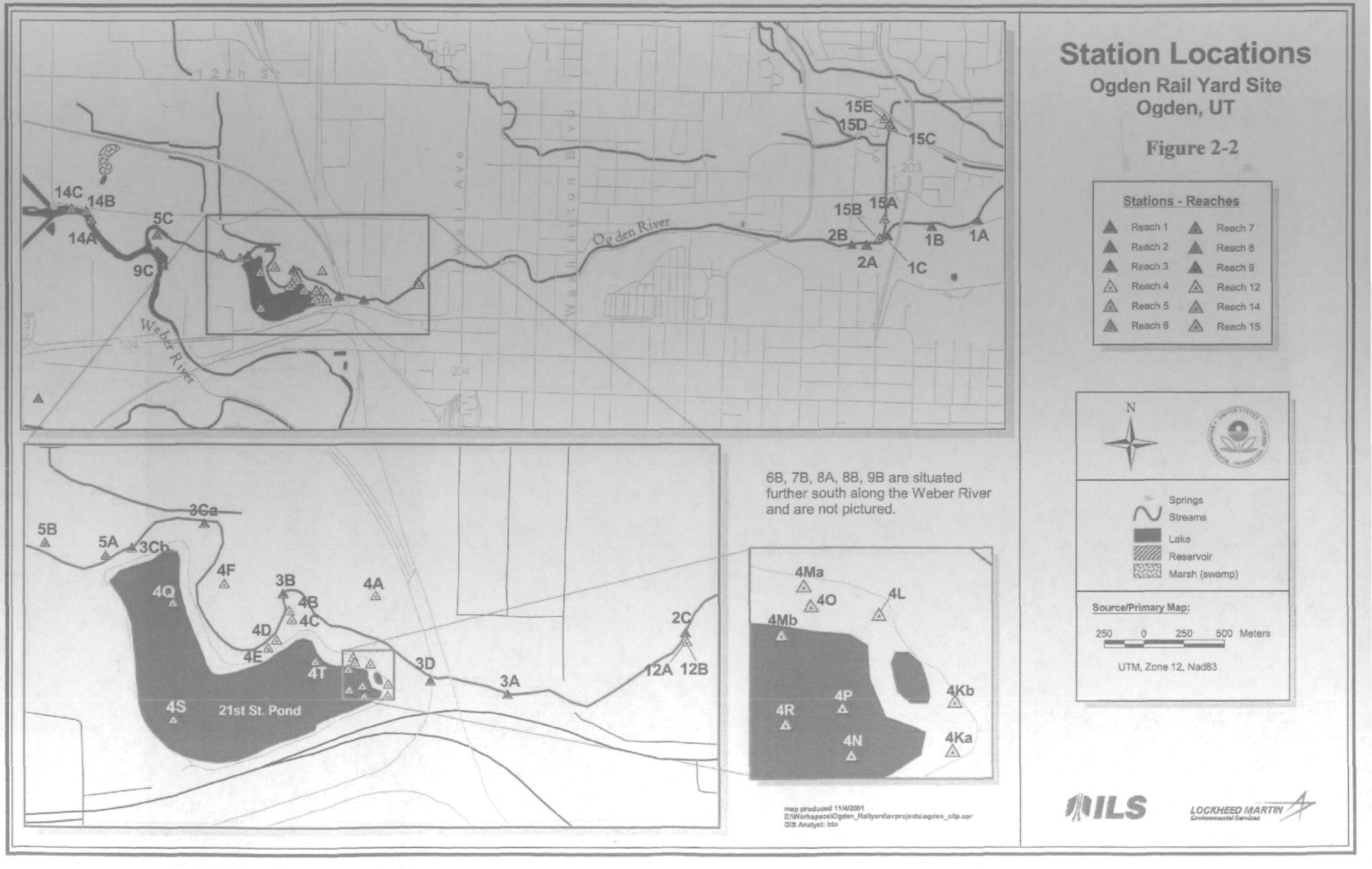

Station Locations

Ogden Rail Yard Site
Ogden, UT

Figure 2-2

Stations - Reaches

- Reach 1
- Reach 2
- Reach 3
- Reach 4
- Reach 5
- Reach 6
- Reach 7
- Reach 8
- Reach 9
- Reach 12
- Reach 14
- Reach 15

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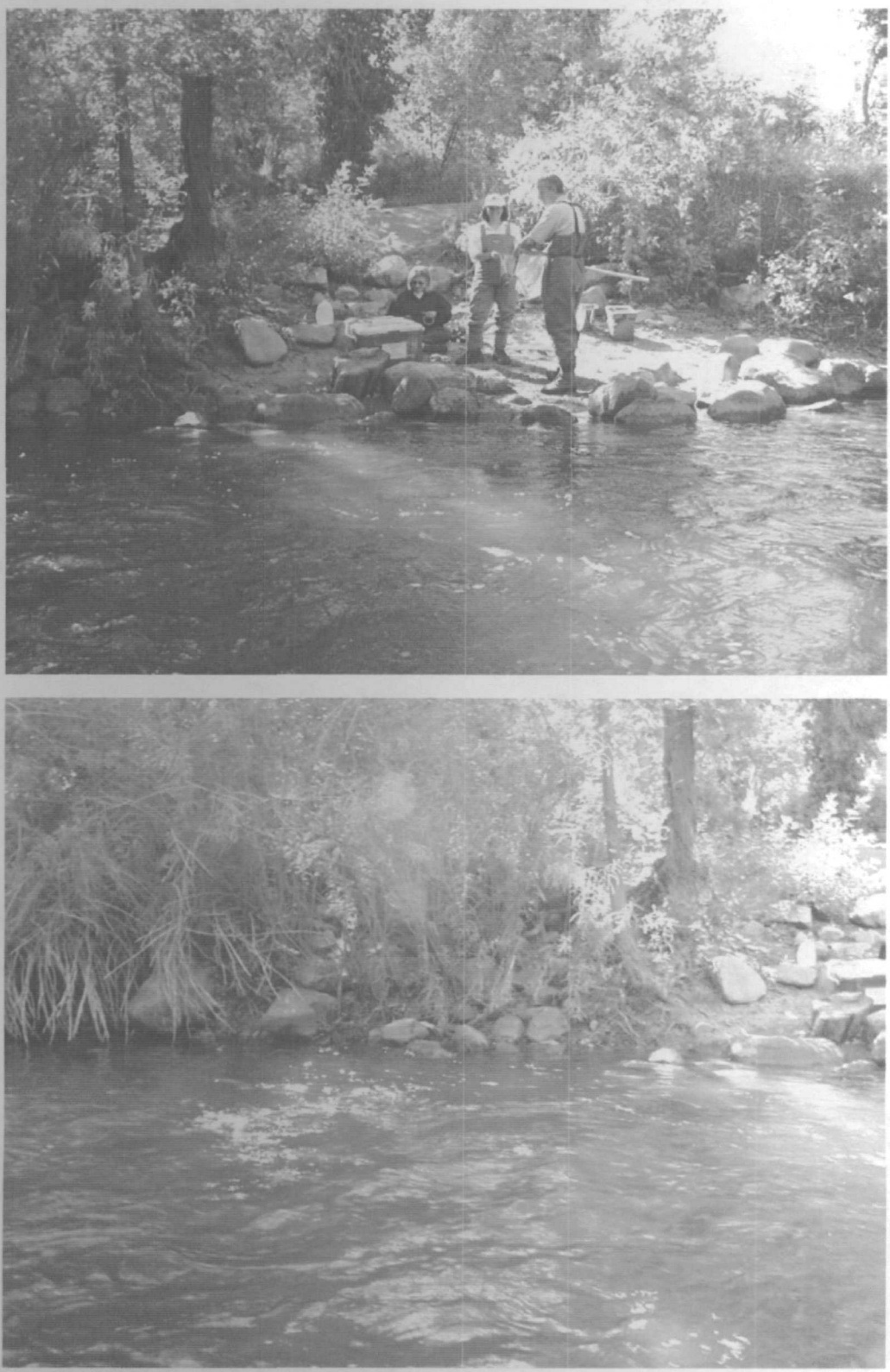


Figure 2-3 Sampling Location OGR-01A
Ogden River, upstream of Pioneer Power Plant

Figure 2-3 Sampling Location OGR-01B
Ogden River, upstream of Pioneer Power Plant Aqueduct

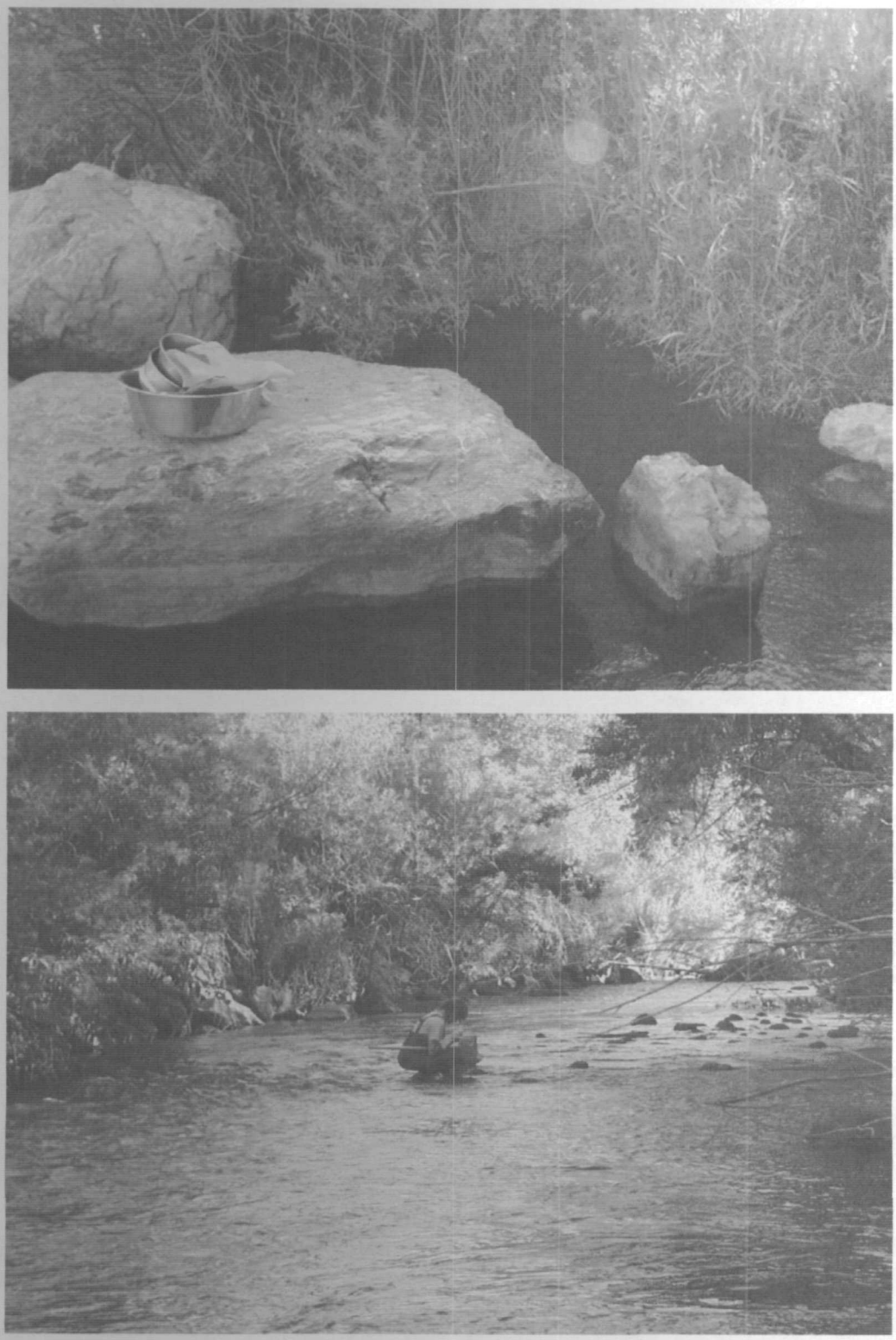


Figure 2-3 Sampling Location OGR-01C
Ogden River, upstream of Pioneer Power Plant Aqueduct

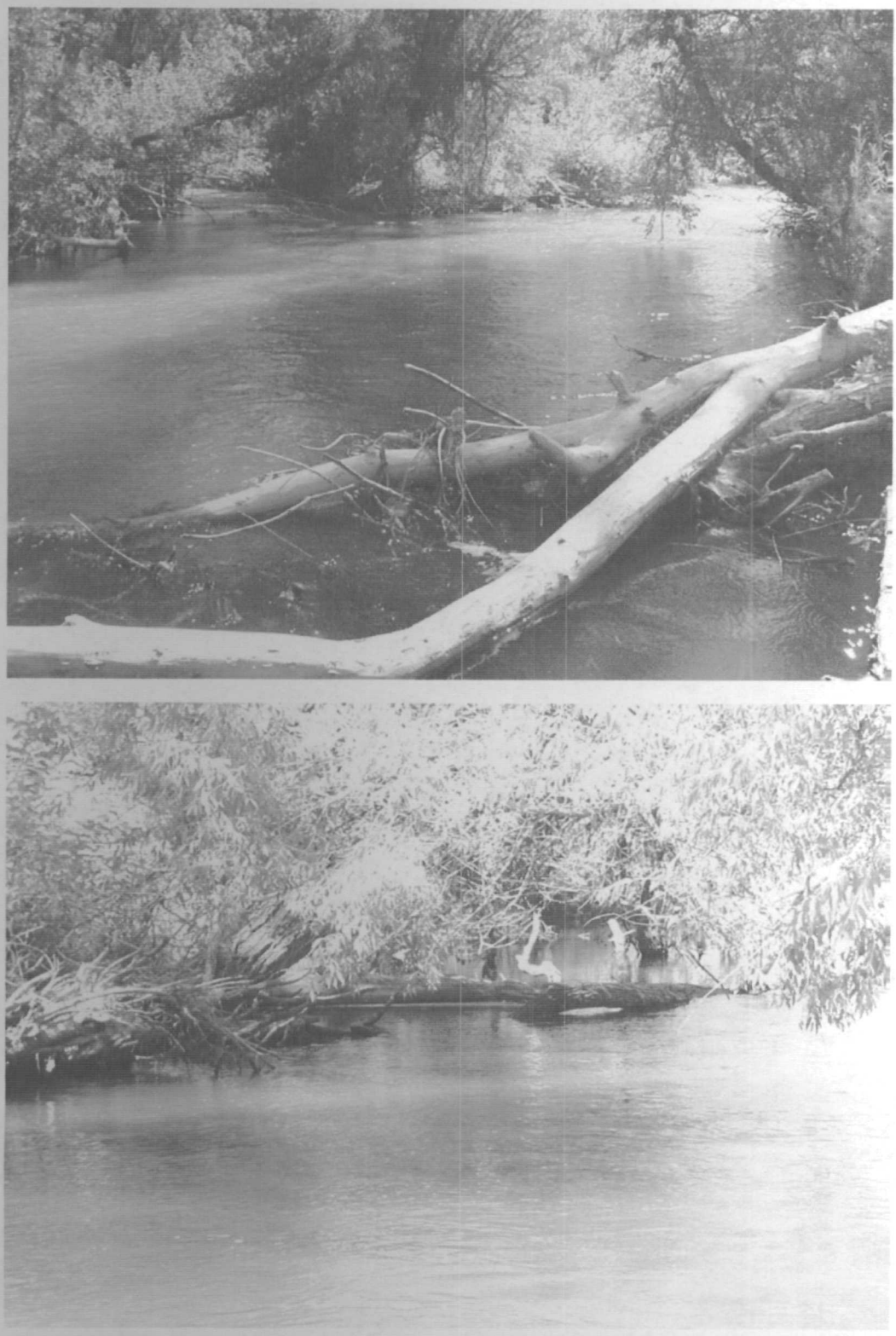


Figure 2-3 Sampling Location OGR-02A
Ogden River, immediately below Pioneer Power Plant Aqueduct

OGR-02B, Ogden River below Pioneer Power Plant Aqueduct

OGR-02C, Ogden River upstream of Wall Avenue Strom Sewer Outfall

Figure 2-3 Sampling Location OGR-02B and OGR-02C
Phase 3 Field Investigation Report

OGR-03A, Ogden River

OGR-03B, Ogden River between inflow and outflow of 21st St. Pond

**visible sheen noted at this station when sediments were disturbed*

Figure 2-3 Sampling Locations OGR-03A and OGR-03B
Phase 3 Field Investigation Report

OGR-03C, Ogden River above 21st St. Pond outfall

OGR-03D, Ogden River at train trestle

Figure 2-3 Sampling Locations OGR-03C and OGR-03D
Phase 3 Field Investigation Report

Surface Soil Sampling Location 21SP-04A

Surface Soil Sampling Location 21SP-04B

Figure 2-3 Soil Sampling Locations
Phase 3 Field Investigation Summary Report

Surface Soil Sampling Location 21SP-04C

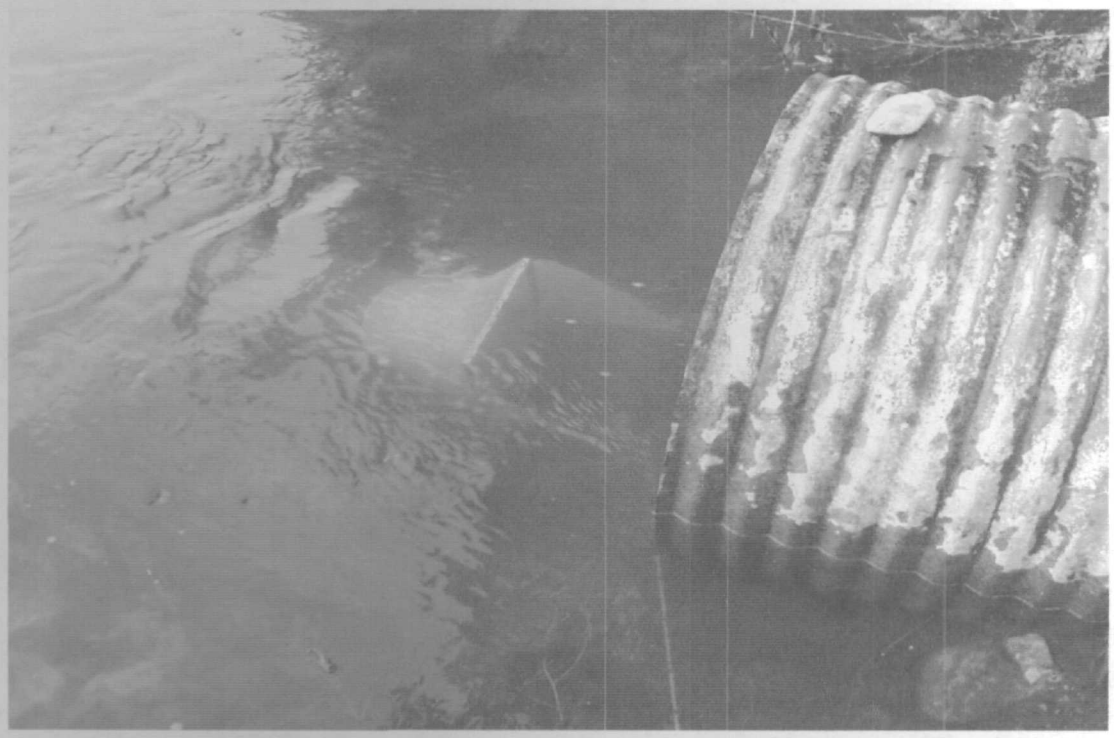
Surface Soil Sampling Location 21SP-04D

Figure 2-3 Soil Sampling Locations
Phase 3 Field Investigation Summary Report

Surface Soil Sampling Location 21SP-04E

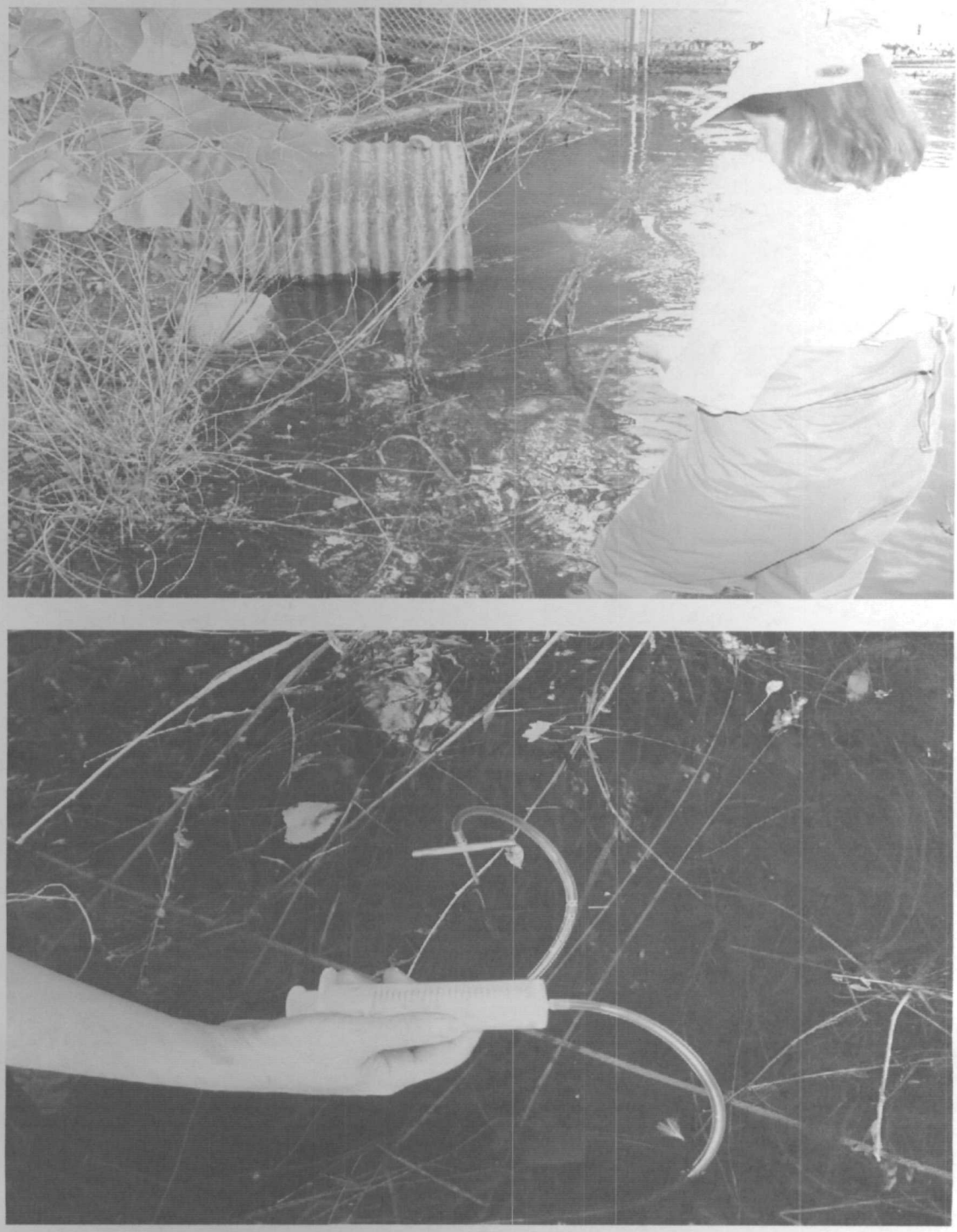
Surface Soil Sampling Location 21SP-04F

Figure 2-3 Soil Sampling Locations
Phase 3 Field Investigation Summary Report



21st Street Pond Inlet Sample 21SP-04J

Figure 2-3 Sampling Locations
Phase 3 Field Investigation Summary Report



21st Street Pond 21SP-04L

Figure 2-3 Sampling Locations
Phase 3 Field Investigation Summary Report

21st Street Pond 21SP-04M

Figure 2-3 Sampling Locations
Phase 3 Field Investigation Summary Report

21st Street Pond 21SP-04O

Figure 2-3 Sampling Locations
Phase 3 Field Investigation Summary Report

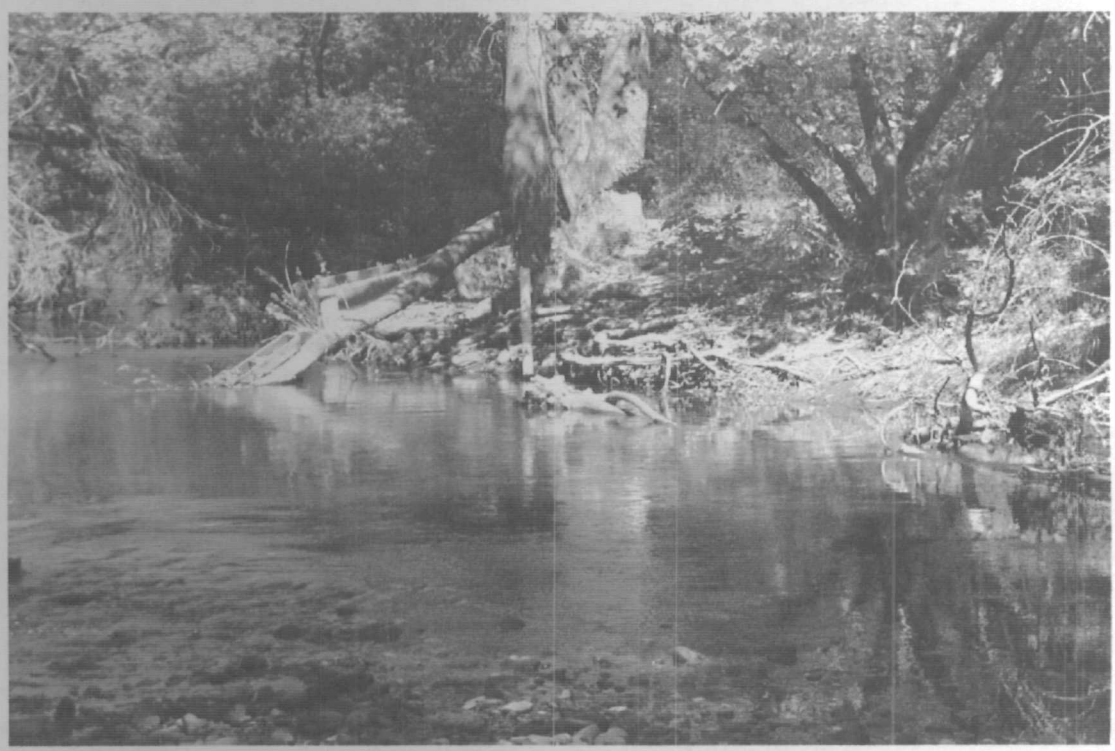


Figure 2-3 Sampling Location OGR-05A
Ogden River Immediately below 21st St. Pond Outfall
Phase 3 Field Investigation Report

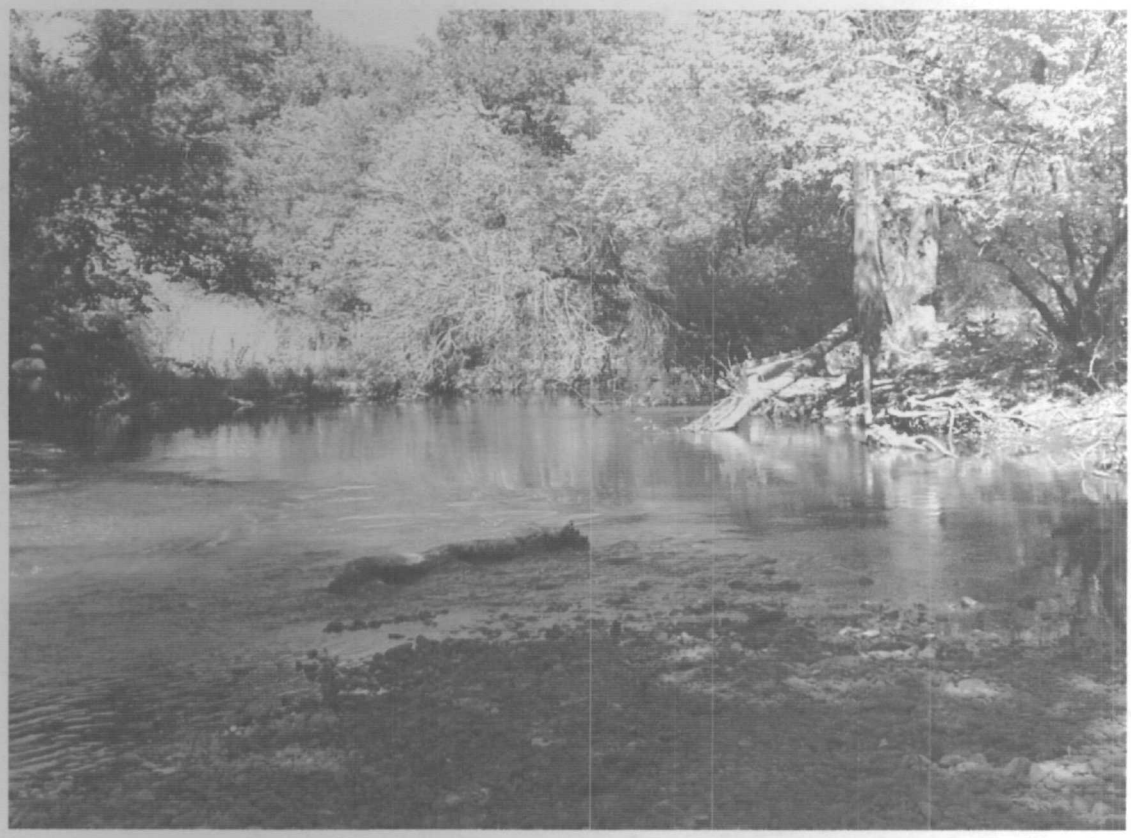


Figure 2-3 Sampling Location OGR-05A
Ogden River Immediately below 21st St. Pond Outfall
Phase 3 Field Investigation Report

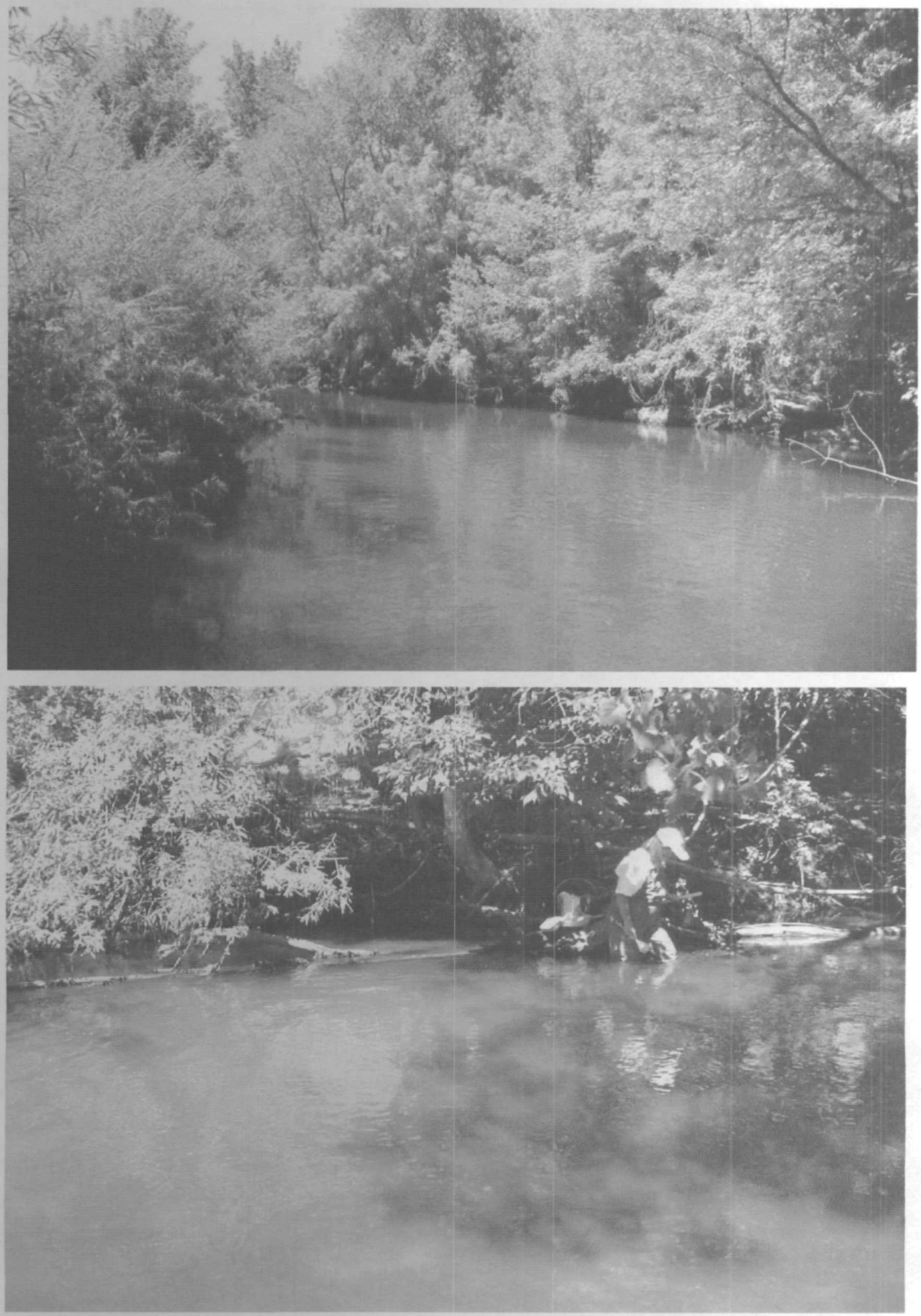


Figure 2-3 Sampling Location OGR-05B
Ogden River downstream of 21st St. Pond Outfall and OGR-05A
Phase 3 Field Investigation Report

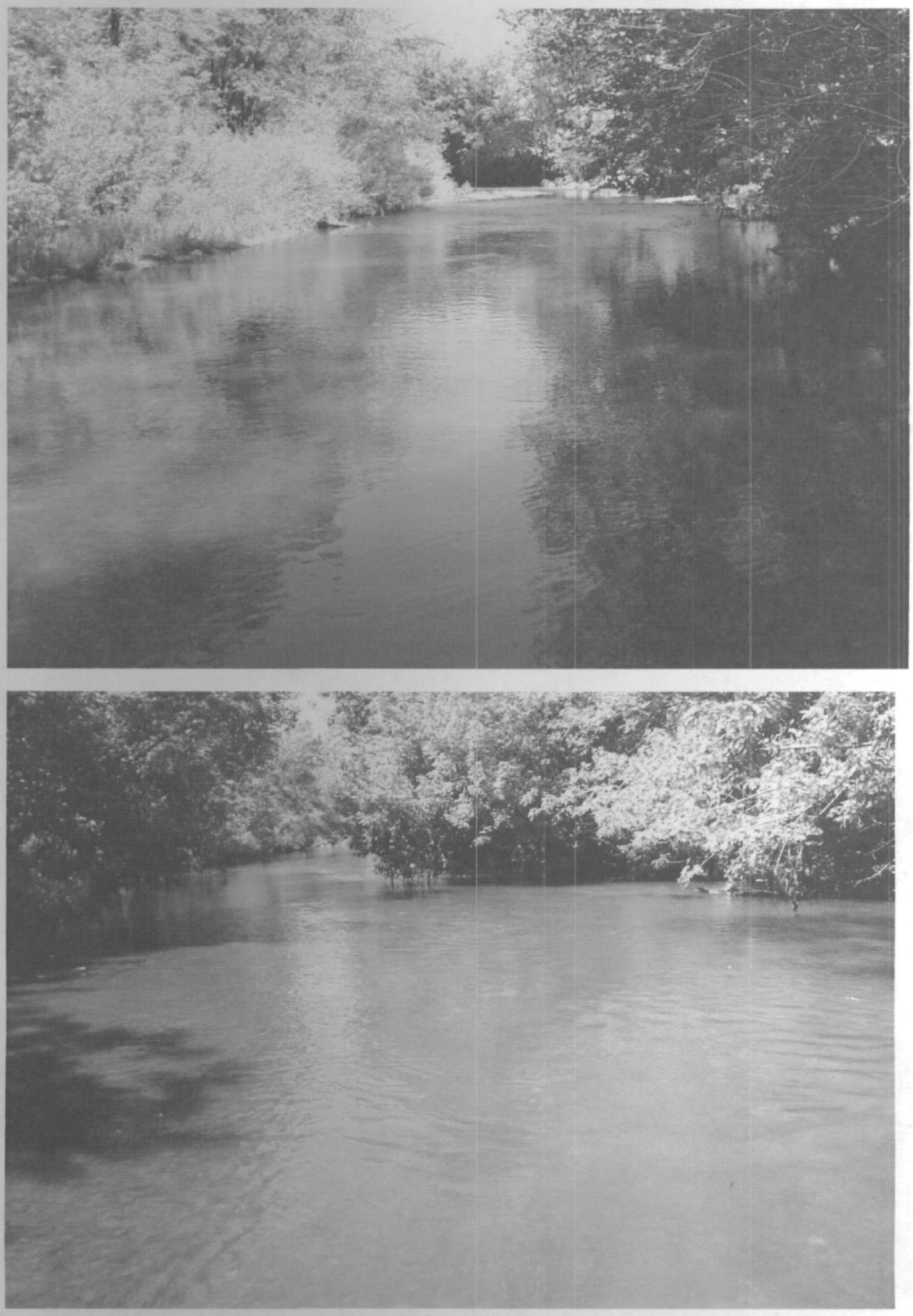


Figure 2-3 Sampling Location OGR-05B
Ogden River downstream of 21st St. Pond Outfall and OGR-05A
Phase 3 Field Investigation Report

Figure 2-3 Sampling Location OGR-05C
Ogden River immediately above confluence with Weber River
Phase 3 Field Investigation Report

Figure 2-3 Sampling Locations BVP-08A and BVP-08B
Buena Ventura State Park Pond
Phase 3 Field Investigation Report

Figure 2-3 Sampling Locations WBR-09B
Weber River downstream of Buena Ventura State Park Pond
Phase 3 Field Investigation Report

Figure 2-3 Sampling Locations WSD-12B
Wall Avenue Storm Drain Outfall
Phase 3 Field Investigation Report

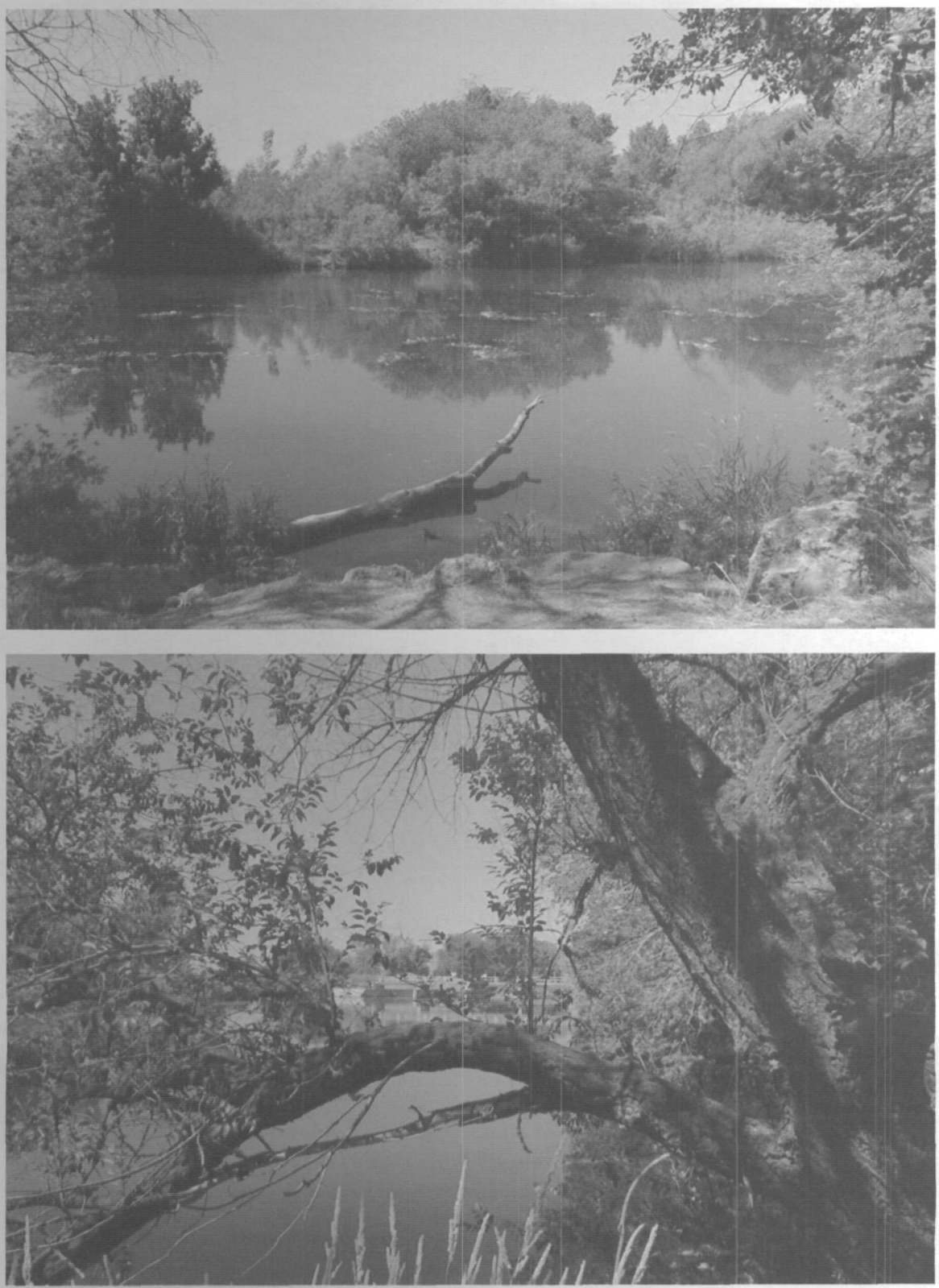


Figure 2-3 Sampling Location WBR-14C
Weber River below Confluence with Ogden River
Phase 3 Field Investigation Report

Figure 2-3 Sampling Location WBR-14C
Weber River below Confluence with Ogden River
Phase 3 Field Investigation Report

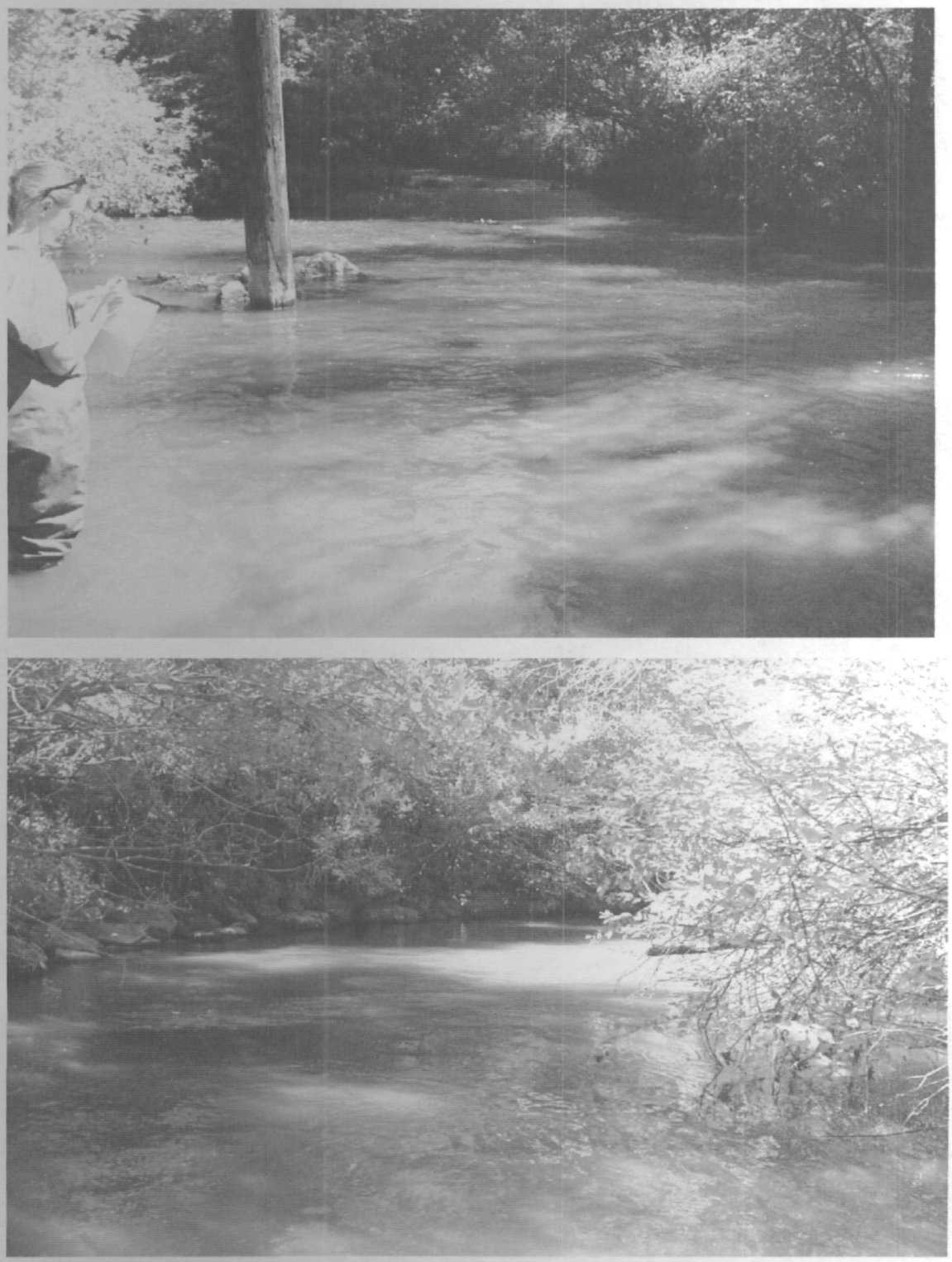


Figure 2-3 Sampling Location PPP-15A
Pioneer Power Plant Aqueduct
Phase 3 Field Investigation Report

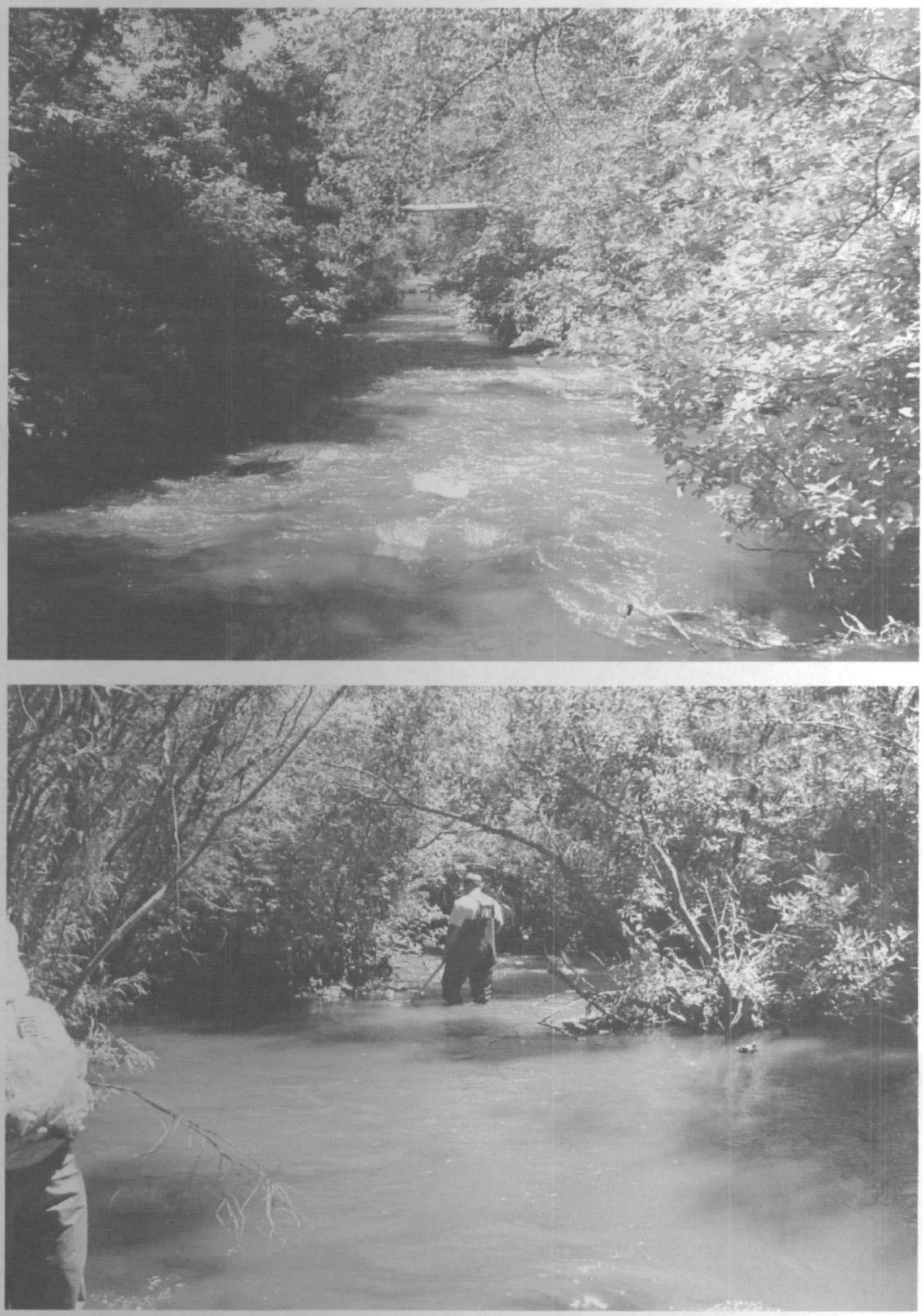


Figure 2-3 Sampling Location PPP-15B
Pioneer Power Plant Aqueduct
Phase 3 Field Investigation Report

Sampling Location PPP-15C, Below Confluence with Lynn Canal

Sampling Location PPP-15D, Lynn Canal below Diversion

Figure 2-3 Pioneer Power Plant Aqueduct
Phase 3 Field Investigation Report

Figure 2-3 Sampling Location PPP-15E
Lynn Canal at Mill Creek Apartments
Pioneer Power Plant Aqueduct
Phase 3 Field Investigation Report

Figure 4-1

Comparison of Split Samples to Parent Field Samples for CLP Results

Phase 3 Field Sampling Summary Report
Ogden Railyard Site, Ogden, Utah

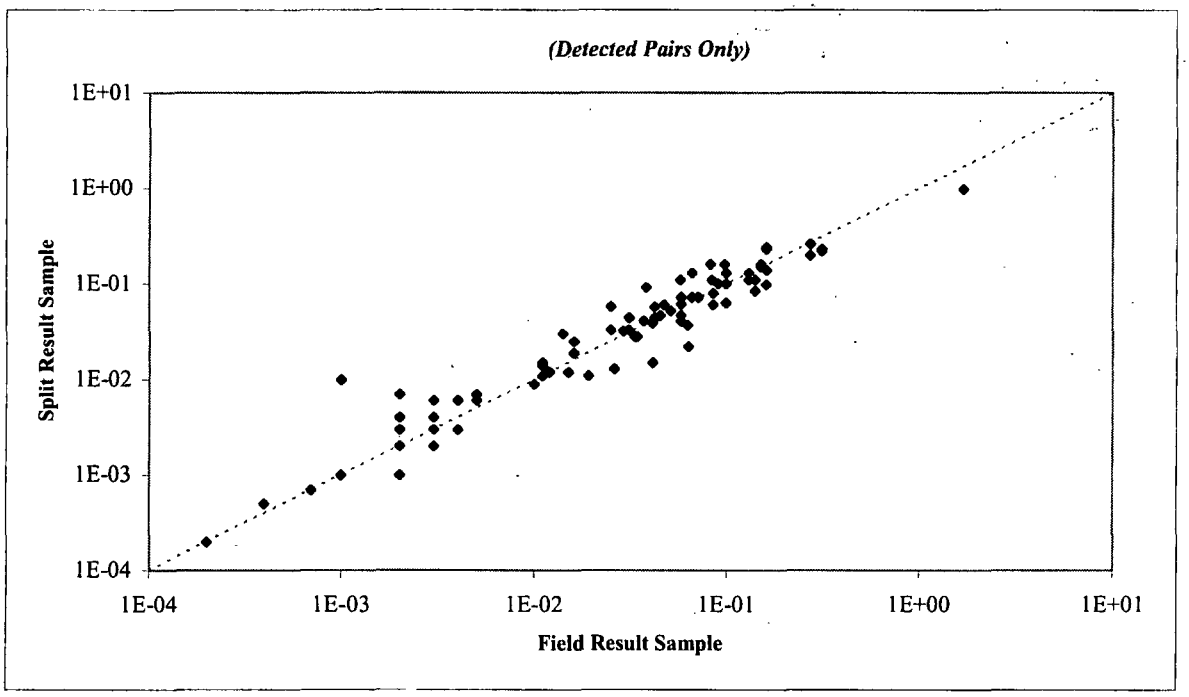
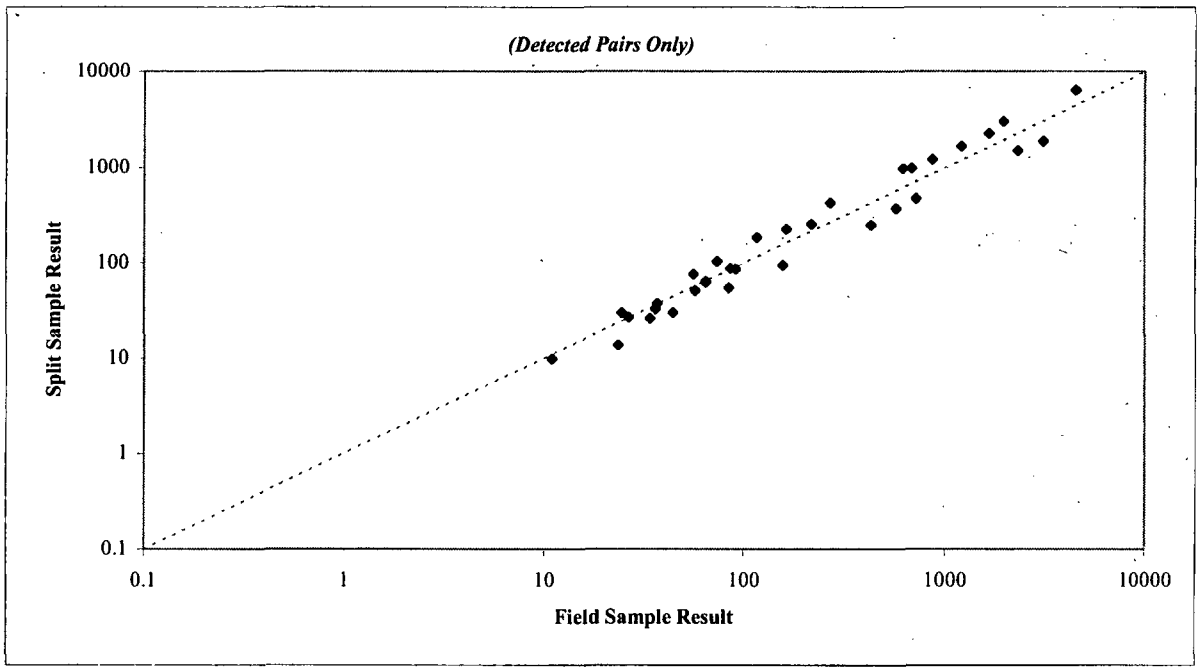


Figure 4-2
Comparison of Split Samples to Parent Field Samples for MRI Results

Phase 3 Field Sampling Summary Report
Ogden Railyard Site, Ogden, Utah



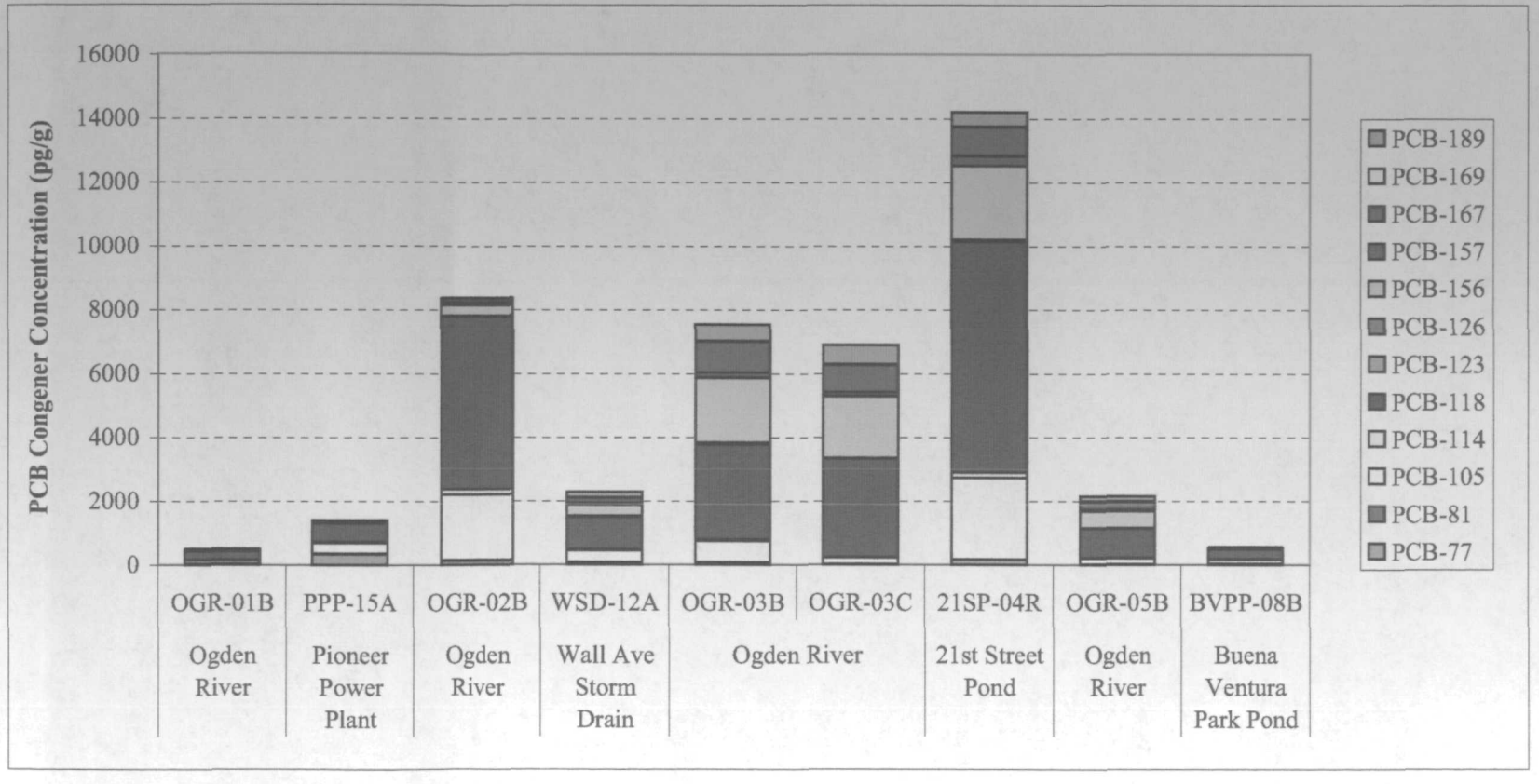
Color Chart(s)

The following pages contain color that does not appear in the scanned images.

To view the actual images, please contact the Superfund Records Center at (303) 312-6473.

Figure 5-2
Summary of PCB Congener Concentrations in Sediment

Phase 3 Field Sampling Summary Report
Ogden Railyard Site, Ogden, Utah

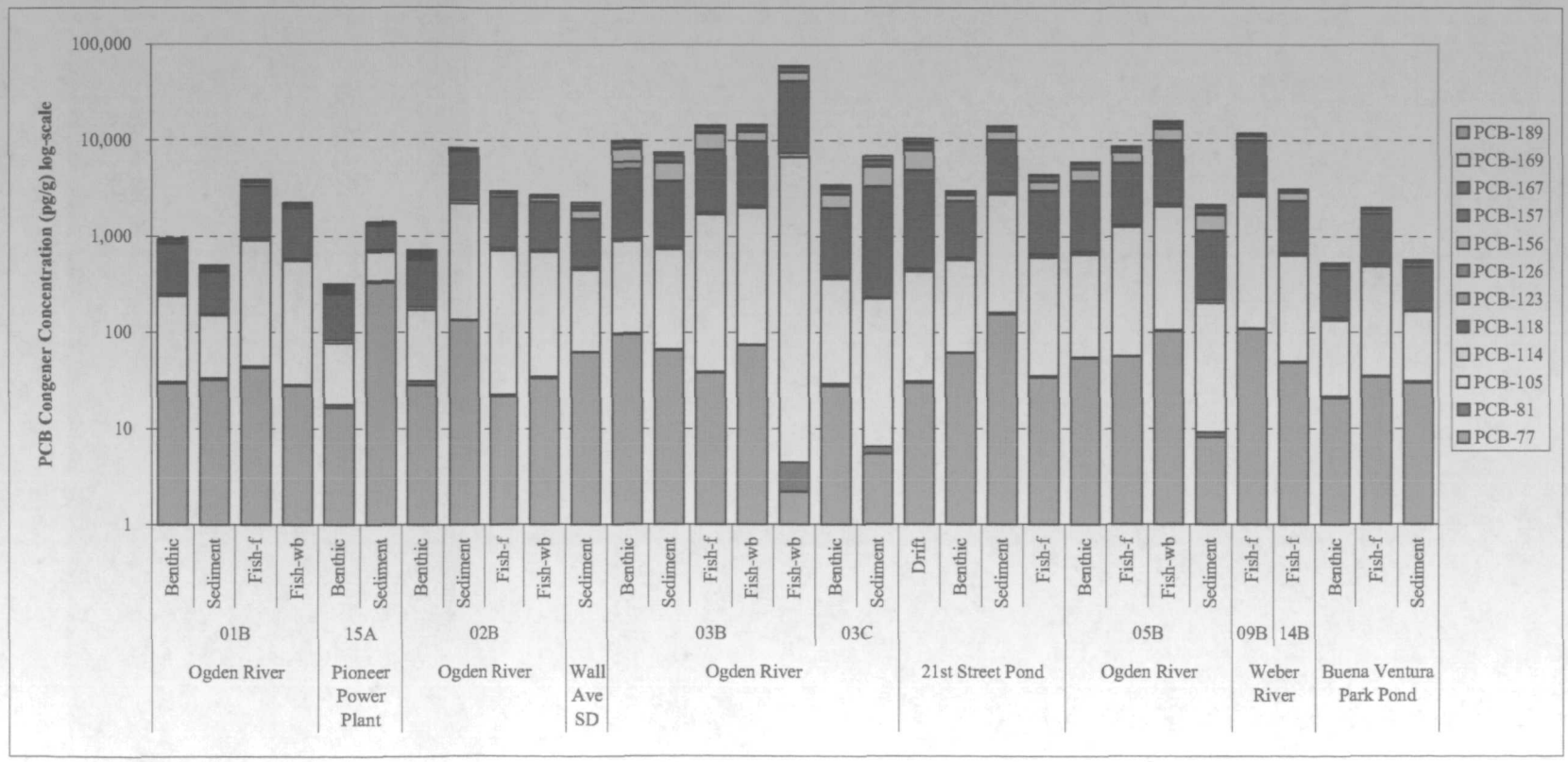


PCB Cong Tables & Figures.xls: Fig 5-2 sed
10/25/2002

Figure 5-3

Summary of PCB Congener Concentrations for Sediment, Benthic Invertebrate and Fish Tissue Samples

Phase 3 Field Sampling Summary Report
Ogden Railyard Site, Ogden, Utah

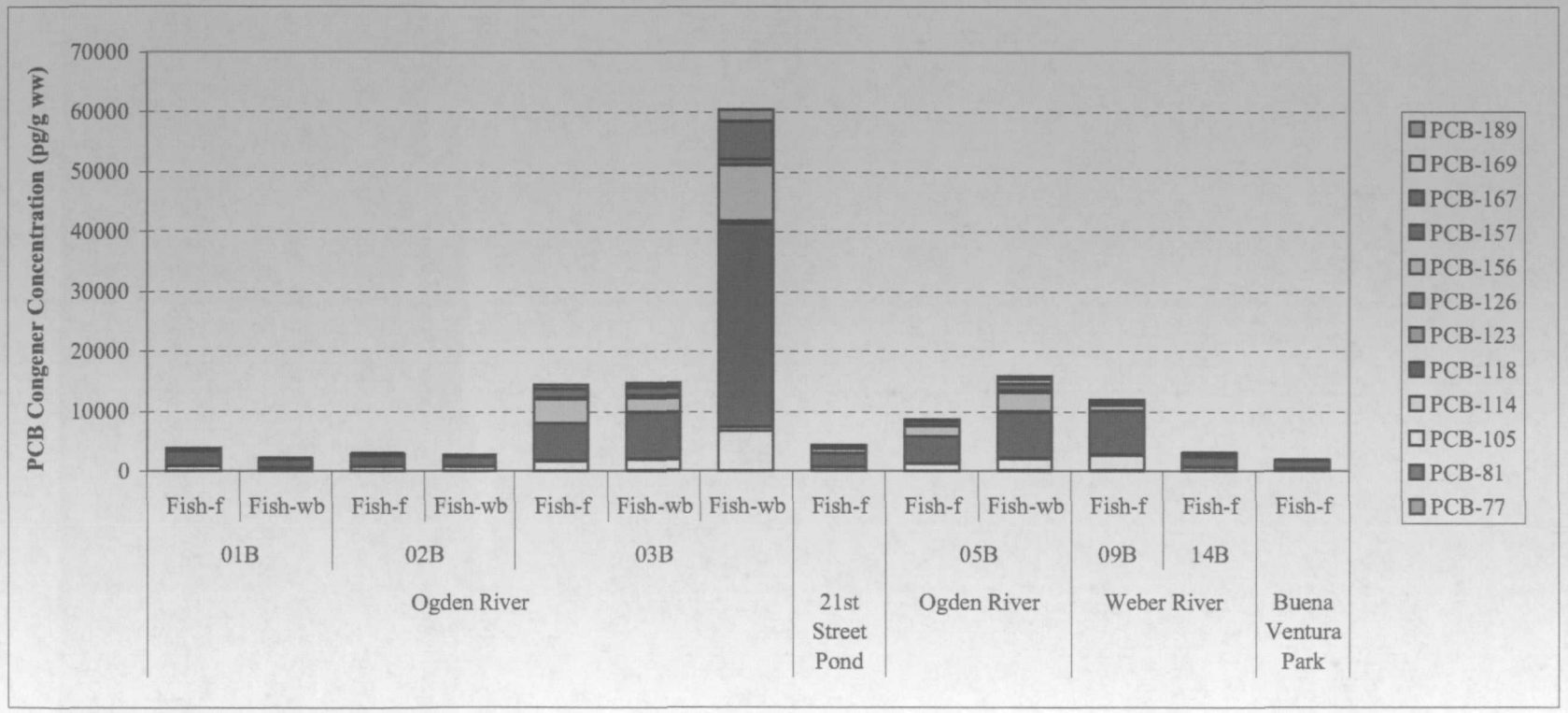


Fish-f = fillet; Fish-wb = whole body

PCB Cong Tables & Figures.xls: Fig 5-3 all cong data
10/25/2002

Figure 10-1
Summary of PCB Congener Concentrations in Fish Tissue

Phase 3 Field Sampling Summary Report
Ogden Railyard Site, Ogden, Utah



Fish-f = fillet; Fish-wb = whole body

APPENDICES

Phase 3 Field Investigation Summary Report
July and August 2001
Ogden Railyard Site, Ogden, Utah

APPENDICES HAVE NOT BEEN ALTERED SINCE THE DRAFT DECEMBER 7, 2001 REPORT THEREFORE THEY WILL NOT BE RESUBMITTED IN THIS DELIVERABLE

Copies of the Appendices are available upon request

APPENDIX A

Copy of Field Log Book

Phase 3 Field Investigation Summary Report
July and August, 2001
Ogden Railyard Site, Ogden, Utah

APPENDIX B

Chain of Custody Records

Phase 3 Field Investigation Summary Report
July and August, 2001
Ogden Railyard Site, Ogden, Utah

APPENDIX C

Analytical Data Results

Phase 3 Field Investigation Summary Report
July and August, 2001
Ogden Railyard Site, Ogden, Utah

APPENDIX D

Data Validation Reports

Phase 3 Field Investigation Summary Report
July and August, 2001
Ogden Railyard Site, Ogden, Utah

APPENDIX E

Toxicity Evaluation of Sediment with *Hyalella azteca*

Phase 3 Field Investigation Summary Report
July and August, 2001
Ogden Railyard Site, Ogden, Utah

APPENDIX F

Benthic Invertebrate Bioassessment of Ogden River, Weber River, 21st Street Pond and Buena Ventura Park Pond, Ogden, Utah

Phase 3 Field Investigation Summary Report
July and August, 2001

APPENDIX G

Copy of Fish Collection Permit and Report for Collection, Salvage or Banding to
State of Utah Division of Wildlife Resources
COR Number 1COLL5299
July 17, 2001 to September 30,2001

Phase 3 Field Investigation Summary Report
July and August, 2001
Ogden Railyard Site, Ogden, Utah

ACORD™ CERTIFICATE OF LIABILITY INSURANCE

DATE 11/18/2003

PRODUCER
Insurance Concepts, Inc.
1770 E. Fort Union Blvd. #100

Salt Lake City UT 84121-2852

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INSURERS AFFORDING COVERAGE

INSURED
EC Environmental
8119 S Angel Street

Sandy UT 84070-

INSURER A: NATIONAL ENVIRONMENTAL COVERAGE
INSURER B: ALLIED
INSURER C:
INSURER D:
INSURER E:

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YY)	POLICY EXPIRATION DATE (MM/DD/YY)	LIMITS	
A	GENERAL LIABILITY	4000001453-021	08/11/2003	08/11/2004	EACH OCCURRENCE	$ 1,000,000
	[X] COMMERCIAL GENERAL LIABILITY				FIRE DAMAGE (Any one fire)	$
	[ ] CLAIMS MADE [X] OCCUR		/ /	/ /	MED EXP (Any one person)	$ 5,000
					PERSONAL & ADV INJURY	$ 1,000,000
			/ /	/ /	GENERAL AGGREGATE	$ 2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:				PRODUCTS - COMP/OP AGG	$ 2,000,000
	[X] POLICY [ ] PRO-JECT [ ] LOC		/ /	/ /		
B	AUTOMOBILE LIABILITY	ACP BA 7520940882	07/31/2003	07/31/2004	COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
	[ ] ANY AUTO					
	[ ] ALL OWNED AUTOS		/ /	/ /	BODILY INJURY (Per person)	$
	[X] SCHEDULED AUTOS					
	[ ] HIRED AUTOS		/ /	/ /	BODILY INJURY (Per accident)	$
	[ ] NON-OWNED AUTOS					
			/ /	/ /	PROPERTY DAMAGE (Per accident)	$
	GARAGE LIABILITY				AUTO ONLY - EA ACCIDENT	$
	[ ] ANY AUTO		/ /	/ /	OTHER THAN AUTO ONLY: EA ACC	$
					AGG	$
	EXCESS LIABILITY		/ /	/ /	EACH OCCURRENCE	$
	[ ] OCCUR [ ] CLAIMS MADE				AGGREGATE	$
						$
	[ ] DEDUCTIBLE		/ /	/ /		$
	[ ] RETENTION $					$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY		/ /	/ /	WC STATU-TORY LIMITS [ ] OTH-ER	
					E.L. EACH ACCIDENT	$
			/ /	/ /	E.L. DISEASE - EA EMPLOYEE	$
					E.L. DISEASE - POLICY LIMIT	$
	OTHER		/ /	/ /		

DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS
N.E.C LISTED UDER CG20-10 FORM: UNITED STATES, THE STATE OF UTAH, BOUNTIFUL CLEANERS INC., AND BOWEN COLLINS & ASSOC. /PROJECT: GROUND CHECK FOR CONTAMINATION AT BOUNTIFUL CLEANERS, FEDERALLY FUNDED EPA PROJECT

CERTIFICATE HOLDER [X] ADDITIONAL INSURED; INSURER LETTER: A

( ) - ( ) -

SUPERFUND REMEDIAL SECTION, 8EPR-SR
US EPA, REGION VIII
999 18TH STREET, SUITE 300
DENVER CO 80202-2466

CANCELLATION

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AUTHORIZED REPRESENTATIVE Cindy Boyer

IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

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The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.

Syracuse Research Corporation
999 18th Street, Suite 1975
Denver, CO 80202
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USEPA Response to UPRR Comments on the Draft Phase 3 Field Investigation Report
Date: October 29, 2002

This document presents USEPA's response to comments received from the UPRR project team on the Draft Phase 3 Field Investigation Report in Support of Risk Assessment at Ogden Railyard (dated December 7, 2001). The Final Phase 3 Field Investigation Report has been revised in accord with these comments, as appropriate.

Comments

1. UPRR Comment: Section 1.2, page 1-1. The bulleted list of chemicals should be revised to state that there was only one detected pesticide in one site soil sample. Also, the referenced Forrester Group document should be updated to 2001 from (Forrester Group, 2000).

EPA Response: This list of chemicals on this page is simply a summary of all chemical classes detected, without respect to frequency of detection. Therefore, no change was made. Reference to the Remedial Investigation document has been updated to Forrester Group (2001) as recommended.

2. UPRR Comment: Section 1.2, page 1-2, first full paragraph. The typo in the third line should be changed from "SAP" to "as".

EPA Response: Text has been changed as recommended.

3. UPRR Comment: Section 2.0, page 2-1, PCB investigation heading. Delete the word "plan" after (USEPA, 2001b).

EPA Response: Text has been changed as recommended.

4. UPRR Comment: Table on Page 2-7, Porewater Detection Limit for Benzo(a)pyrene. Please explain why the 10 ppb detection limit for benzo(a)pyrene is acceptable, inconsideration of the 0.2 ppb detection limit required for benzo(a)pyrene in groundwater at the site.

EPA Response: The 0.2 ppb detection limit for benzo(a)pyrene referred to in the comment is a human-health risk-based concentration for groundwater. This section summarizes the detection limits required for evaluating hazards to benthic macroinvertebrates (BMI) from direct contact with sediment porewater. The BMI final chronic value for benzo(a)pyrene in porewater is 1 ppb, and this is the target detection

limit needed. Therefore, the CLP SVOA detection limit of 10 ppb is not considered acceptable. Because of this, all PAHs were analyzed utilizing selective ion monitoring (SIM), which decreased detection limits by a factor of about 10.

5. UPRR Comment: Section 4.2.1, page 4-4, first paragraph. In the last sentence, TOC analyses are described as being conducted by Severn Trent labs. UPRR is unaware of any EPA Phase 3 analyses being conducted by this lab.

EPA Response: Severn Trent laboratories analyzed the first round of sediment samples for total organic carbon using analytical method 9060.

6. UPRR Comment: Section 5.2.1.1, page 5-3, last paragraph. The first sentence of this paragraph states that 10 SVOCS were detected in the Ogden River sediment samples; however, 13 are highlighted in the table.

EPA Response: Text has been changed to reflect the correct number of detected analytes.

7. UPRR Comment: As highlighted in the draft report (see Section 5.2.1.2), it was incomplete (for example, certain "PAH by SIM" data was not included). UPRR requests the opportunity to review a complete report.

EPA Response: The Final Phase 3 Field Investigation Report will include all BNA SIM results that were not provided in the draft report, as well as the PCB and dioxin congener results from the second round of sampling performed by MRI in January 2002.

8a. UPRR Comment: In a number of circumstances, it is very difficult to determine the units in which analytical results are reported. In some cases, different units are reported for the same compounds in the same media . For example, PCB in sediments are presented in units of micrograms per kilogram in Table 5-3, and in units of picograms per gram in Table 5-4. This needlessly complicates comparison and evaluation of data. The number of different units used to present results should be reduced and standardized.

EPA Response: Results tables have been revised to present standard units across all analytes with the exception of PCB congener results. With regard to the comparison of Aroclor concentration and PCB congeners, it is important to note that for PCBs concentrations for Aroclor and congeners are not intended to be directly compared. Only 12 of 209 possible PCB congeners were analyzed using Method 1668 (a highly sensitive analysis method with detection limits of ppt). The less sensitive analysis of PCBs as Aroclor conducted by CLP provides a total concentration of the Aroclor mixture (with detection limits of about 10 ppb). Because of this, the sum of these 12 congener concentrations is not equal to the total PCB concentration and should not be directly compared to measured concentrations as Aroclor. PCB congeners results should be interpreted based on the toxicity equivalency (TEQ) approach.

8b. UPRR Comment: It would be best to have the units stated in a column on the left hand side of the table, right next to the analyte. At a minimum, the units should be clearly stated on each page of the table.

EPA Response: Tables have been changed to include the units next to each analyte as recommended.

9. UPRR Comment: The report makes reference to "seep bank" or "seepage bank" samples (for example, see Section 5.2.1.1). Please clarify the nature of these samples, with respect to soil type (e.g., fine-grained sediments) and location (e.g., above or below the current and historic pond water level).

EPA Response: Table 2-1 and Figure 2-2 in the revised report identify the location of samples collected from "seep bank" areas in the 21st Street Pond. At the time of the Phase 3 sampling (July and August 2001) there was one seep area within the fenced area, above the water level on the south end of the 21st Street Pond and several seep areas near the Ogden River inflow on the north bank of the 21st Street Pond, above the water level. Each of these areas could have been below water level historically. The soil type at these seep areas was not documented.

10. UPRR Comment: Based on the PAH concentrations reported in Table 5-1, it is assumed that certain of the sediment samples may have been taken from locations visibly impacted by DNAPL. It would be helpful to understand which of the samples contained DNAPL or were taken in locations with visible DNAPL presence.

EPA Response: The text has been revised as requested. In brief, samples 21SP-04P and 21SP-04K (within fenced area) and sample 21SP-04R (just outside of the fence in the pond) had a petroleum-type odor, and the sediments appeared to have a sheen with speckles of black oily substance. Of these stations, sediments from 21SP-04P appeared to be most impacted of all 21st Street Pond locations.

11. UPRR Comment: In previous discussions of the Phase 3 activity, EPA has emphasized the observation of a sheen somewhere in the Ogden River. If EPA still believes this is a significant finding, the observation should be documented (character and location of sheen, samples collected, results, etc.)

EPA Response: The observation of a sheen in the Ogden River occurred at sample location OGR-03B (informally referred to as the "Baby Doll seep"). Figure 2-3 has been modified to document the observation of a sheen at this location. This rainbow-like sheen appeared for a short period of time after sediments were disturbed with a stick. A summary of the samples collected and measured concentrations for this location are provided in the final report. At this time, the USEPA has not taken any additional steps to determine if the sheen observed is indicative of DNAPL contamination at this location.

12. UPRR Comment: Section 5.2.2.2, page 5-4. The report states that PCBs were detected in OGR-03C using the congener method, but were not detected using the Aroclor method. Providing some additional text would clarify the reason for this – the concentration detected using the congener method (total concentration of detected PCB congeners of approximately 7 ppb) was considerably less than the Aroclor method detection limit (45 ppb). A different and perhaps more interesting set of results (not discussed in the Phase 3 report) is that for OGR-05B. In this sample, the concentration reported for the congener method was 2.1 ppb, while the concentration reported for the Aroclor method was 110 ppb.

EPA Response: As stated previously, PCB concentrations based on Aroclor mixtures and congeners should not be directly compared because the sum of the 12 PCB congeners analyzed is not equal to the total PCB concentration and is not expected to equal the Aroclor concentration. The congener analysis is much more sensitive than the Aroclor analysis with detection limits approximately 1000 times lower. Therefore, it is not surprising that a sample may have been below detectable levels based on the Aroclor method but had detectable levels based on the congener method.

13. UPRR Comment: Section 2.2.3, page 5-4 and 5-5. Including the total organic carbon (TOC) data presented in this table into the PAH and PCB data tables (e.g. Table 5-1) would enhance data interpretation. (Theoretically, the PCB and PAH concentrations will be a function of the sample's TOC.) Also, please state the TOC analytical method.

EPA Response: Total organic carbon data are presented in Table 5-6 in the final report. The TOC data were not added to the data summary tables (Tables 5-2 to 5-5) because it would require an alteration in the document organization. However, the report has included a figure which presents both the raw measured Arcolor concentration (ug Aroclor/ kg sediment) and the TOC-adjusted Aroclor concentration (ug Aroclor/ g TOC) as a function of spatial location to facilitate data interpretation.

The text has been changed to identify the method used to measure total organic carbon (Method 9060).

14. UPRR Comment: There was apparently excellent agreement between the two different PAH analytical methods (CLP and SIM) for pore water, as evidenced by results for sample 21SP-04N (see Tables 7-1 and 7-2 of the Phase 3 Report). However, comparison of results for a sediment sample (OGR-05C) indicated that PAH concentrations reported with the SIM method (Table 5-2) were generally an order of magnitude lower than concentrations reported with the CLP method (Table 5-1). How does EPA intend to deal with this significant discrepancy? Which concentrations will be used for risk assessment purposes?

EPA Response: As noted above, EPA collected the SIM data based on the expectation that the lower detection limits associated with this method would be needed to evaluate ecological risks. Sediment concentrations from the SVOA method will be compared to sediment quality benchmarks for benthic invertebrates to clearly illustrate the need for

the SIM method, and the interpretation of risks to benthic invertebrates from PAHs will focus on the sediment and porewater concentrations measured using the SIM method.

Observations

The USEPA generally agrees with most of the UPRR observations and findings presented in the comments for the Draft Phase 3 Field Investigation Report. However, EPA does not agree with one of the observations offered by UPRR, as summarized below.

UPRR Observation: The PCB concentrations detected in Ogden River sediments in EPA's Phase 3 investigation (maximum reported concentration of 180 ppb, Aroclor 1280 in OGR-03A) were much lower than the concentrations detected in the UPRR investigation (maximum reported concentration of 4,200 ppb Aroclor 1260 in OSDR-5). If both sets of data are accurate, this indicates a significant decline in PCB concentrations in the river. However, there is apparently significant heterogeneity in PCB concentrations in the Ogden River sediments, as evidenced by the disparate results for split sample OGR-03A (see Table 5-3 of the Phase 3 Report).

EPA Response: EPA does not think that the difference in Aroclor values referred to above should be viewed as evidence of a significant decline in PCB concentrations between sampling events. PCBs are quite stable in the environment, and there is little reason to think that a major decline would have occurred over such a relatively short period. As the comment notes, an alternative (and more likely) explanation is simple variability in concentration as a function of sampling location, due to differences in total organic content, grain size, depositional area vs riffle area, etc.

Also, USEPA does not think that the sample results from the field sample and the split sample at OGR-03A should be viewed as "disparate". The field sample yielded a PCB Aroclor concentration of 140 ug/kg (Aroclor 1254) and the split sample yielded a PCB Aroclor concentration of 180 ug/kg (Aroclor 1260). Thus, the concentration levels are quite similar. The assignment of Aroclor mixture type is a subjective decision made by the laboratory analyst, and EPA does not feel that the decision to characterize one pattern as 1254 and another as 1260 is indicative of any key differences.